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FROM

A. M. Fairlie

# Fifth Biennial Report

—OF THE—

# West Virginia

# STATE BOARD OF AGRICULTURE

—FOR THE—

## Years 1899 and 1900.

CHARLESTON:
BUTLER PRINTING COMPANY
1900.

# FIFTH

# BIENNIAL REPORT

—OF THE—

# WEST VIRGINIA—

# STATE BOARD OF AGRICULTURE

—FOR THE—

## YEARS 1899 AND 1900.

CHARLESTON
Butler Printing Company,
1900.

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# APPOINTMENTS SINCE THE ORGANIZATION OF THE BOARD.

| NAME. | COUNTY. | CONGRESSIONAL DISTRICT. | OFFICE. | WHEN APPOINTED. | SERVED UNTIL. |
|---|---|---|---|---|---|
| B. F. Fisher | Braxton | First | Member | April 1st, 1891 | April 1st, 1892. |
| C. R. Sperow | Berkeley | Second | Member | April 1st, 1891 | July 1st, 1895. |
| *J. M. Rowan | Monroe | Third | Member | April 1st, 1891 | April 1st, 1893. |
| T. C. Atkeson | Monongalia | At Large | Member | April 1st, 1891 | Still serving. |
| S. S. Jacob | Ohio | First | Member | April 1st, 1892 | July 1st, 1897. |
| †W. L. Swope | Monroe | Third | Member | April 1st, 1893 | February 9th, 1897. |
| J Q. Rathburn | Kanawha | At Large | Member | July 1st, 1895 | July 1st, 1899. |
| *Alex. Clohan | Berkeley | Second | Member | July 1st, 1895 | April 8th, 1898. |
| J. M. Sydenstricker | Greenbrier | Third | Member | March 1st, 1897, | Still serving. |
| S. W. Atkinson | Brooke | First | President | July 1st, 1897 | Still serving. |
| *H. W. Miller | Morgan | Second | Member | April 9th, 1898 | February 19th.1900. |
| James George | Mason | Fourth | Member | July 1st, 1899 | Still serving. |
| J. C. Lewellen | Taylor | Second | Member | February 19th, 1900 | Still serving. |

*J. M. Rowan, Alex. Clohan, and H. W. Miller retired to accept other positions. †William L. Swope died while in office.

# OFFICERS ELECTED SINCE ORGANIZATION OF BOARD.

H. M. Turner, Secretary, elected Apl. 1st, 1891, served until Apl. 1st, 1893.

C. C. Brown, Secretary, elected Apl. 1st, 1893, served until October 1st, 1897.

D. M. Sullivan, Secretary, elected Oct. 1st, 1897, served until Oct. 13, 1899.

J. B. Garvin, Secretary, elected Oct. 13, 1899, still serving.

## *Institute Director.*

C. C. Brown, elected October 1st, 1897, served until Oct. 18, 1899.

D. M. Sullivan, elected October 18, 1899, still serving.

## *Consulting Members.*

E. W. Lupton, Horticulturist, Martinsburg, West Virginia.
R. L. Morris, Civil Engineer, Morgantown, West Virginia.
E. C. Vose, Meteorologist, Parkersburg, West Virginia.
William Petrie, Veterinarian, Wheeling, West Virginia.
F. P. Ruhl, Veterinarian, Fairmont, West Virginia.
J. C. Callandar, Veterinarian, Parkersburg, West Virginia.
W. M. Stanley, Veterinarian, Charles Town, West Virginia.
S. E. Hershey, Veterinarian, Keyser, West Virginia.
Salmon Wells, Dairyman, Josiah, West Virginia.
Wm. F. Brown, Pomologist, Arroyo, West Virginia.
J. M. Correll, Poultryman, Lewisburg, West Virginia.
G. G. Naylor, Apiarin, Lockhart, West Virginia.

## LETTER OF TRANSMITTAL.

Office State Board of Agriculture.
Charleston, West Virginia.

*To his Excellency George W. Atkinson,*
*Governor of the State of West Virginia:*

SIR:—We have the honor to transmit to you herewith, as required by statute, the Fifth Biennial Report of the State Board of Agriculture for two years ending October 1, 1900.

Very respectfully,

S. W. ATKINSON,
*President.*

J. B. GARVIN,
*Secretary.*

# FIFTH BIENNIAL REPORT

—OF THE—

# STATE BOARD OF AGRICULTURE.

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Office of Board, Capitol Building
Charleston, West Virginia.

*To the Legislature of West Virginia:*

The following pages present a brief outline of the work of the State Board of Agriculture for the Fifth Biennial period ending October 1st, 1900. In some respects it differs from previous reports, less space being devoted to statistics, but such as are given have been obtained direct, and carefully and accurately complied.

More space than usual is devoted to a general review of the departments and institutions created with a view to aid and encourage the agricultural and horticultural interests of the State, together with supplementary reports and papers by men of known ability and practical experience. The plan adopted in this report suggests itself as being one that would be instructive and interesting to the toilers on our farms, those who constitute more than one-half of the population of our rapidly growing State.

While West Virginia is looked upon as being one of the richest among the states, in mineral, timber and oil, and her wealth is generally considered from this view point, the fact should not be overlooked that the product of her farms exceed in value all other interests combined.

The season of 1899 was not on the whole, favorable, and the yield of some crops was below the average, yet the corn crop was estimated at 18,043,584 bushels; wheat, 3,880,751 bushels; oats, 3,158,442; rye, 132,290 bushels: and buckwheat, 238,255 bushels. Total value, $16,695,847. Potatoes, 2,672,784 bushels; valued at $1,398,848. Hay, 6,083,031 tons, valued at $6,083,031. The live stock in the past two years numbered 237,935 head of horses and mules; 506,488 head of cattle; 675,351 head of sheep; and 541,080 head of hogs. Estimated at a low average value, amount to $16,685,493. The value of the poultry industry alone for the two years is estimated at $1,781,884.

The foregoing furnishes sufficient proof that the agricultural resources of the State already exceed that of every other industry, and there is room for much greater and more extensive development. This industry forms the permanent basis of the States wealth, and should solicit the deepest interest of our law-makers and receive the encouragement it so justly deserves.

Two of the leading branches of farming and that to which West Virginia is well adapted, are stock-raising and fruit-growing. The raising of improved live stock is on the increase and the number of improved breeders is rapidly increasing. The "come-and-go-easy" methods together with the "pennyroyal cow" and the "razor-back hog" are rapidly becoming a thing of the past. We have large areas of land which, if properly utilized, would afford excellent grazing for more than double the number of stock which is now kept. As to the adaptability of our soil and climate for successful fruit culture, it hardly seems necessary to more than merely mention the fact that West Virginia fruit was awarded second prize at the Paris Exposition, the exhibit being closely contested in competition with other States and countries. The honor thus conferred on the fruit growers of West Virginia should stimulate and encourage the development of the industry, as this marked recognition will give our fruits a standing in the foreign markets which will result beneficially to our orchardists. The development of this industry in the State has as yet only assumed the initial stage and there are splendid opportunities awaiting the enterprising fruit grower.

This, together with the rapid development of our varied soil production, can be largely increased if progressive measures are judiciously undertaken and properly maintained, and it is the policy of this department to foster and promote all these interests. The work will stand still or progress in proportion to the encouragement it receives. In view of the work merely touched upon, and in order that this department may receive the aid and assistance necessary and that such rules and regulations be enacted, as will not only benefit the cause of agriculture, but result in much good to the greatest number, we are persuaded to call your attention to the recommendations which follow, and trust they will meet with your hearty endorsement:

## RECOMMENDATIONS.

FIRST: We insist that the law creating this Board and governing the same, be strictly observed.

SECOND: The Institute work is proving to be a great factor in the education of the farmer, and the urgent demands made upon this department, for more and better service, is steadily increasing; and that the good work so well begun may continue to grow, we therefore urge that sufficient means be provided to meet all the necessary demands upon this department. During the past two years 72 successful institutes have been held and this important work should be pressed steadily forward.

THIRD: Owing to the great and growing interest in thoroughbred live stock, we respectfully call your attention to House Bill No. 72, Chapter 53, for the prevention and spread of contagious diseases among domestic animals. As this important industry is rapidly increasing, and the interchange of live stock is yearly becoming greater, the liability to contagious diseases is very much greater. We therefore recommend that a law be enacted to prevent the importation of dairy and breeding animals into the State, having contagious or infectious disease. The Board has performed efficient service in stamping out contagious diseases, affecting domestic animals in many parts of the State. But a great deal remains to be done which will necessitate considerable out-lay. In order that the department may be able to cope with the many diseases which are a menace to the dairymen and stock interests, we respectfully ask that at least $1,500.00 per annum be appropriated to carry on the work as far as necessity may require. If it were necessary to divide this sum equally among the fifty-five counties of the State, the apportionment would be insignificant.

FOURTH: Accurate and reliable statistics of the State crop and stock production is a matter of very great interest, and yet there is no regulated system provided by which such data can be obtained. The law requiring State and County officers to furnish such information as this Board desires, is inadequate and difficult to obtain in time to be of use in compiling this Biennial Report. And, further, the county assessors are not properly equipped for doing the work. We earnestly request that the law may be amended; that the county assessors can be furnished with the proper blanks, suitably arranged for taking the acreage and production of crops and the number and value of all live stock, and such other information as will be of value to this department and of general interest to the public; and that he be required to return the same to the office of this Board, immediately after the work is completed, and that he be allowed sufficient compensation for the extra labor required.

FIFTH: "The West Virginia Farm Review" issued under the direction of this Board, has gradually increased in circulation until it now numbers nearly 9000 copies each month. The publication seems to meet the approval of the farmers in many important particulars. It keeps them informed of the work the department is doing in every part of the State, and is an educational medium which seems to be indispensable. Desiring to make it more efficient and useful, we recommend that a sufficient amount be appropriated for its further continuance.

SIXTH: Owing to the rapid destruction of our forests, it is high time that something be done looking toward the preservation and protection of our timber-lands.

SEVENTH: Realizing the economic value of our birds to the agriculturist, we recommend the enactment of a law and provisions for its proper enforcement which will effectually protect our song and game birds.

EIGHTH: Owing to the rapid progress and advancement of the other sciences, and wishing to see the science of agriculture kept abreast with the times, we would earnestly recommend the enacting of a law requiring the teaching of elementary agriculture in our public schools.

NINTH: There has been but little improvement in our public highways in the past few years, and recognizing the imperfect conditions of a large per cent. of the roads over which the farmer is compelled to haul his produce—which in most cases is done at a loss, saying nothing of the wear and tear of team and wagon —we urge that some provision may be made which will assist in the permanent improvement and maintenance of our public highways.

TENTH: It is well known that a large per cent. of manufactured produce used as food is adulterated. The question of food for the human family is one of vast importance, both to the producer and the consumer, and requires prompt and aggressive measures. A thorough investigation of the subject reveals the fact that injurious adulterations are used in the manufacture of a large per cent. of the ordinary food supplies for the human family, as well as mixed feed for stock. This can and should be regulated by wholesome laws properly executed.

ELEVENTH: The question of pure seeds, free from the seed of obnoxious weeds, is one of economic value to the farmer. In buying grass or clover seed the farmer is likely to purchase the seed of weeds which very frequently become a permanent pest and a serious detriment on the farm. There are also thousands of dollars worse than wasted in buying the seeds which "never grow". The sale of seed which lacks the power of germination, from whatever cause, together with adulterated seed, should be prohibited by law.

TWELFTH: We commend to you the work that is being done by the Agricultural Experiment Station, the College of Agriculture, the State Horticultural Society, the State Wool Growers and Sheep Breeders Association, the State Grange, the Veterinary Surgeons, the Meteorologist and the Civil Engineer, who are rendering such excellent service and co-operating with the Department in the up-building of our agricultural interests.

THIRTEENTH: In the work contemplated for the next two years we hope to meet as nearly as possible all the demands which are made upon this Department. The means provided will determine very largely the progress that is to be made. To successfully carry on the work will require a total annual appropriation of ten thousand dollars (10,000.00), and we trust it will be your good pleasure to appropriate this amount for this Department, which represents the interests of that class of people who pay the largest share of the taxes.

Very respectfully,
S. W. ATKINSON, President.
J. B. GARVIN, Secretary.

# LAW OF 1895, PRESCRIBING THE DUTIES OF THE STATE BOARD OF AGRICUTURE.

## CHAPTER 33.

*Be it enacted by the Legislature of West Virginia:*

That sections 1, 2, 3, 4, 5, 6 and 7 of chapter 101 of the Acts of 1891, be amended and re-enacted, and additional sections added thereto, so as to read as follows:

1. That there shall be established a State Board of Agriculture, consisting of one commissioner from each Congressional District within this State and one from the State at large. The said commissioners shall be appointed by the Governor. They shall be practical farmers, engaged in the business, not more than three of whom shall belong to the same political party. The term of office of said commissioners shall be for four years, beginning the first day of July, 1895.

*Provided*, That the present commissioners of the Second and Fourth districts shall serve until July 1, 1895. And further *Provided*, That the present commissioners from the First and Third districts serve until July 1, 1896, when their successor shall be appointed for one year. Vacancies shall be filled by the Governor as they occur.

2. Said board shall meet on the first Monday in April and October of each year, and oftener if necessary, at such times and places in the State as the board may determine, *Provided*, That the time of said meetings shall not exceed twenty-five days in any one year. Said board, at their meeting on the first Monday in October, 1895, shall elect one of their number president, whose term of office shall be for two years, and also a secretary who shall not be a member of the Board, and whose term of office shall be for two years. Their successors in office, at the end of their respective terms, shall be elected by the Board as they occur. Vacancies during the term of either of said officers shall be filled by the Board for the unexpired term. The said officers shall hold their positions until their successors are elected.

3. Said commissioners, for their services, shall receive four dollars per day and actual traveling expenses in attending the meetings of the Board. The secretary, for his services, shall re-

ceive a salary, to be fixed by the Board, and not to exceed one thousand dollars ($1,000) per year and actual traveling expenses in attending the meetings of the Board, and it shall be the duty of the secretary, under the direction of the Board, to superintend the publication of The Farm Reporter monthly, should the Board direct the monthly publication of the same.

4. The said secretary shall keep an itemized account of all his expenses and expenditures under this chapter, and shall render statement thereof, under oath, to the Board, which, if found correct, shall be allowed and paid.

5. It shall be the duty of said Board to look after and devise means of advancing the agricultural interests of the State; to promote and encourage as far as practicable the holding of farmer's institutes, the organization of agricultural and horticultural societies, and other associations in the interest of agriculture, in the several counties of the State.

It shall have charge of the preparation in manuscript, the printing, publishing and distribution, by mail and otherwise, of such documents and reading matter as they may deem best for the agricultural interests of the State. And said Board shall include in its publication, the methods of farming in use, the variety of stock and crops grown, the special capacities and aptitudes of the soils, to the various products of the latitude and climate, the needs of the farmers, and such other matters as will convey a proper idea of the agricultural resources of the State, to practical men. They shall have authority to request of any State official, or any official in any county, city or town, any and all statistical and other information, the Board may desire. It is hereby made the duty of all State and county officers to assist in every way possible, and co-operate with the Board, upon their request, to the end that the welfare and interest of agriculture may be promoted. It shall hold farmers' institutes for the instruction of the farmers of the State, in the various branches of agriculture.

Such institutes shall be held at such times and places in each year, as said Board may direct. The said Board shall make such orders and regulations as it may deem proper, for organizing and conducting such institutes, and may employ an agent, or agents, to perform such work in connection therewith, as they may deem best.

The course of instruction of such institutes, shall be so arranged as to present to those in attendance, the results of the most recent investigations in theoretical and practical farming.

6. It shall be the duty of the secretary to attend all meetings of the Board, keep a careful record of all their proceedings, in proper books provided by the Board, and keep on file all papers relating to the office.

To issue, under direction of the Board, a monthly, a bi-monthly or quarterly publication containing crop reports, agricultural statistics and such other matter as the Board may determine. He shall, before the assembling of each regular session of the Legislature, compile a report giving a general review of agriculture, horticulture and industrial resources of the State, with brief notices of each county, and the character of the public roads in the several counties, and how and by whom operated and kept in repair; the character of labor generally employed in the cultivation of the soil, and the prices paid therefor, and a report of the various institutes held during each year, and such other information as he is required to gather; and he shall have a sufficient number printed for the use of the Legislature, and for general distribution, and perform such other duties as the Board may prescribe.

7. The Board shall report all its proceedings biennially to the Governor, showing in detail the manner of its execution of the provisions of this act, which, together with the publication and report named in section 6, and such incidental printing as may be necessary shall be printed by the public printer and paid for same as other public printing.

8. The secretary shall have a permanent office at the capitol, under the control and supervision of the Board, which shall be supplied and maintained at the expense of the State.

9. A sum not exceeding three thousand dollars ($3,000.00) is hereby annually appropriated out of any funds in the treasury not otherwise appropriated for the support and maintenance of the Board, including *per diem* of members, salary of Secretary, necessary expenses of the Board and secretary while attending meetings, and all other incidental expenses connected with and growing out of this Department of the State Government, which shall be paid on the order of the Board, signed by the President and Secretary.

10. All acts and parts of acts in conflict with this act are hereby repealed.

## CHAPTER 53.

(Passed Feb. 24, 1899. In effect ninety days after passage.)

AN ACT to prevent the spread of contagious diseases among domestic animals.

*Be it enacted by the Legislature of West Virginia:*

That chapter nine of the acts of one thousand eight hundred and ninety-seven be amended and re-enacted, and additional sections thereto, so as to read as follows:

Section 1. That when it shall be brought to the notice of the President of the State Board of Agriculture that any contagious or infectious disease, not otherwise provided for by law, prevails among domestic animals, he shall take such measures to prevent its spread as may be deemed expedient, and for this purpose shall have power to place infected animals, herds, buildings and farms in quarantine, and to prevent the movement of animals or objects likely to convey the contagion, except upon proper permits; and with the consent and approval of said board, to make such rules and regulations for the government of such quarantine as may be deemed necessary to effectively carry out the provisions of this act.

Sce. 2. That any person or persons who shall wilfully or intentionally interfere with any officer or officers, duly authorized to carry out the provisions of this act, or who shall wilfully or intentionally violate the provisions of the quarantine authorized by section one of this act, shall be deemed guilty of a misdemeanor, and upon conviction shall be liable to an imprisonment not exceeding three months, or a fine not exceeding one hundred dollars, or both, at the discretion of the court.

Sec. 3. That when, in the judgment of the president of the board, public interest and safety demand it, he may give written authority to any consulting veterinarian of the board, who shall be a graduate of some reputable veterinary college, or he may go in person, taking such veterinarian with him, to examine any animal or animals, or any buildings or farms suspected, and the decision of such veterianrian, or the president of the board and veterinarian acting together, after proper examination, and under the provisions of this act, and such rules and regulations as the board may prescribe, shall be final, and the veterinarian or the president of the board and the veterinarian acting together, shall proceed to quarantine, to destroy, to order burned, or buried,or to take any other action authorized by this act, and the rules of the said board.

It is hereby made the duty of the veterinarian having charge of any case, or the president and veterinarian acting together, to make a full and complete report of the same in writing, to the secretary of said board, under such rules, and in such form as may be, by it, required.

For such services, the president and veterinarian shall each receive a per diem of four dollars per day, and actual expenses, while so engaged, which shall be paid out of current appropriations made for the enforcement of this act and on order signed by the president and secretary of the board.

Sec. 4. That when it shall be found necessary or expedient to kill any animal or animals, to prevent the spread of contagious or infectious diseases, it or they shall first be appraised by three disinterested and sworn appraisers, who shall have due consideration of the actual condition of the animal or animals, at the time of appraisement, and the owner or owners of such animal or animals so destroyed, shall be entitled to receive from the secretary of the board of agriculture, a certificate of value, as appraised by said appraisers, subject to the consent and approval of the said board.

For such services, each appraiser shall receive a per diem of one dollar per day, to be paid out of current appropriations made for the enforcement of this act, and on order signed by the president and secretary of the said board.

Sce. 5. That at the end of each fiscal year, the holders of such certificates of value, issued by the secretary of said board, shall be paid the same, from current appropriations made for the purpose: *Provided*, That the amount to be paid on such certicates, in any one year shall not exceed the sum of three thousand dollars, which amount shall be paid pro rata at the end of each fiscal year, on order signed by the president and secretary of the state board of agriculture.

Sec. 6. That for the economical eradication of contagious or infectious diseases of domestic animals, the president of the State Board of Agriculture shall have power, with the consent and approval of said board, to arrange for and carry into effect terms of co-eperation with the proper officers of the national government.

Sec. 7. That all acts or parts of acts inconsistent herewith are hereby repealed.

# PROCEEDINGS

OF THE

# STATE BOARD OF AGRICULTURE

FOR

## Two Years Ending Oct. 1, 1900.

# PROCEEDINGS OF THE STATE BOARD OF AGRICULTURE, CHARLESTON, FEBRUARY 6th, 1899.

The State Board of Agriculture convened in its rooms in the Capitol Building on the above date, at 8 o'clock P. M. All the members were present excepting Mr. H. W. Miller, who was detained at home by illness. All who were present regretted the absence of this member very much.

The President called for the Minutes of the previous meeting, which were read and approved. The report of Secretary was then called for and read as follows:

## SECRETARY'S REPORT.

*Mr. President, and Gentlemen of the State Board of Agriculture:*

Since our last meeting we have wrestled with several very perplexing questions. As you are aware, it required long and persistent effort to succeed in placing our Fourth Biennial Report within the possession of the public printer. We had scarcely succeeded in accomplishing this when another problem of vastly more importance presented itself to us for our solution, viz: An abiding place for our headquarters during the session of the Legislature. For several days it seemed that we would be compelled to vacate and wander away we knew not where; but thanks to the Governor and other friends to the Department, who has been one of our warmest friends and has cheerfully aided us in every possible way, we are permitted to remain where we are, and our title to this room is virtually settled for the future.

We trust that your Fourth Biennial Report will be satisfactory as it was compiled with great care and attention. This office is in receipt of letters, weekly, from all parts of the United States asking for a great variety of information relative to agriculture and pertaining to all our numerous facilities and products. Our report contains material which will answer any and all such questions. Since our last meeting, our Veterinary Surgeons have had twenty-one (21) horses and one cow appraised and killed, and they have placed in my hands the papers for your consideration. We learn from our Veterinary Surgeons that contagious diseases are prevailing to an alarming extent amongst our domestic animals, which are in a large number of cases considered incurable, and we are conscious that prompt and vigorous effort should be made at once to overcome these diseases, and save thousands of dollars annually to our farmers. You will pardon me, gentlemen, for reminding you of the magnitude of the work that has been contemplated for the coming season. If we fail in performing the full amount we have mapped out, for this year, it will have the effect of a backward step among the farmers of our State, who are expecting more and more from the State Board of Agriculture in the way of relief and general information. All working together and doing the very best we can, we can not possibly meet all the demands coming in to this Department for this season.

The Institute Director has succeeded in organizing all the fifty-five counties of the State, and it will be the imperative duty of the Board to give him every assistance in carrying out his great and noble work.

As you will remember, among other instructions given to your Secretary when he assumed the duties of this office, and the one that was accompanied with greatest emphasis was to avoid the least appearance of anything that smacks of politics in his official work. We did not fully realize the importance of this particular command until we were permitted to mingle with the farmers in their Institutes. One of the greatest difficulties which we had to overcome in some localities, was to convince the farmers that our mission was not in way political, and that it was for their interest and general advancement along the lines of progress, that we had come among them. Then, and not untill then did we receive the sympathy and hearty co-operation of the farmers. It will be necessary to contract for the printing of the Review not later than the 1st of March. I would suggest that you appoint a committee to make this contract as soon as they think it advisable.

Respectfully submitted,

D. M. SULLIVAN,
*Secretary.*

The financial report of the Secretary-Treasurer was submitted. The President appointed T. C. Atkeson and J. Q. Rathburn a committee to audit the account of the Treasurer.

Mr. Sydenstricker. who was appointed to represent the Board of Agriculture at the Pure Food and Drug Congress, at Washington, reported that he was prevented by sickness, from attending. The President then submitted his report, giving some valuable information concerning diseased animals. The Secretary then read a list of the names of the owners of animals which had been destroyed by direction of the Board. which amounted to twenty-one horses and five cattle. After discussing the same, it was moved to lay the report on the table. C. C. Brown then offered the following resolution, which was adopted:

"The State Board of Agriculture in regular session assembled, has carefully considered House Bill No. 72, introduced by Mr. Jarrett, of Greenbrier, and House Bill No. 98, introduced by Mr. Brown, of Hancock, and we believe the provision of these bills will prove very beneficial to the citizens of our State, therefore be it

"*Resolved*, That we heartily indorse these bills, and hope they will be passed by the Legislature."

After disposing of some miscellaneous business, the Board adjourned to meet again at 8:30 A. M., Tuesday.

The Board convened promptly at 8:30 Tuesday morning, transacted some business of a miscellaneous character, and adjourned to attend in a body the meeting of the State Horticultural Society, at the M. E. Church, South.

The Board convened in regular order at 1 P. M., Thursday. The report of the Institute Director being called for, was read and approved and is as follows:

### REPORT OF INSTITUTE DIRECTOR.

*Mr. President and Gentlemen:—*

My second semi-annual report was submitted to you at your meeting here last October, and my first annual report will be found in your Fourth Biennial Report, which is before you at this time, and subject to your inspection. Since my report to you on October 1st, last, twenty-one very successful and well attended Institutes have been held as follows:

| | | | |
|---|---|---|---|
| No. 1. | Falling Springs, Greenbrier County | Oct. | 5th & 6th. |
| No. 2. | Academy, Pocahontas County | " | 7th & 8th. |
| No. 3. | Cowen, Webster County | " | 11th & 12th. |
| No. 4. | Sutton, Braxton County | " | 13th & 14th. |
| No. 5. | Grantsville, Calhoun County | " | 17th & 18th. |
| No. 6. | Glenville, Gilmer County | " | 20th & 21st. |
| No. 7. | Weston, Lewis County | " | 24th & 25th. |
| No. 8. | Bridgeport, Harrison County | " | 26th & 27th. |
| No. 9. | Ripley, Jackson County | " | 28th & 29th. |
| No. 10. | Pennsboro, Ritchie County | Nov. | 17th & 18th. |
| No. 11. | West Union, Doddrdige County | " | 21st & 22nd. |
| No. 12. | Philippi, Barbour County | " | 23rd & 24th. |
| No. 13. | Beverly, Randolph County | " | 25th & 26th. |
| No. 14. | Parsons, Tucker County | " | 28th & 29th. |

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| No. 15. | Terra Alta, Preston County | “ | 30th & 1st. |
| No. 16. | Cassville, Monongalia County | Dec. | 2nd & 3rd. |
| No. 17. | Farmington, Marion County | “ | 5th & 6th. |
| No. 18. | Pruntytown, Taylor County | “ | 8th & 9th. |
| No. 19. | West Liberty, Ohio County | “ | 16th & 17th. |
| No. 20. | Fairview, Hancock County | “ | 21st & 22nd. |
| No. 21. | Beall's Chapel, Mason County | “ | 21st & 22nd. |

From one to four representatives of this Board have attended each of these meetings, and at a goodly number of them the Agricultural Experiment Station was ably represented by the Director or some member of his Staff. You now have a strong and well officered Farmers' Institute Society in each of our fifty-five counties. Being instructed by the Board to devote my time to the preparation of its Fourth Biennial Report, it was my pleasure to attend only five of these very interesting meetings. With a few exceptions, these meetings were well attended, and the foundation laid for future work, which if properly cultivated, will surely bear fruit and prove a mighty influence for the future development of the great agricultural resources and interests of our State.

As a good report of some of these meetings has already appeared in the Farm Review—and the others will be soon—we do not deem it necessary to consume your valuable time with a more extended report at this time. As to the importance and necessities of the Institute work, my views are fully set forth in your Biennial Report, to which reference has already been made. We will only say here that if you measure up to the expectations of the farmers, you will find it necessary to be earnest and zealous in the prosecution of this branch of your work, as more and better service is demanded by the thousands who are now aroused to the importance and value of such work. We congratulate you that your work is already bearing fruit, and that your efforts in behalf of the husbandry of our State are causing many in high positions, to consider more favorably the just claims of our people, and to recognize that the prosperity of the agricultural people of the State, means prosperity to every other legitimate calling, or the people as a whole. You will doubtless read with much pleasure what our chief executive has to say of your work and note how fully he recognizes its great importance to the people of the Commonwealth, and its necessary encouragement to the proper development of our highest and best interests. Many others, in prominent positions, as well as many of our most influential newspapers, have also shown their willingness to join hands with you and assist in the great work which you have undertaken. Besides the Institutes which have been held, arrangements have been made—and are now being made—for thirty Institutes, as follows:

Tent Church, Brooke County, March 1st and 2nd, 1899.
Pleasant Valley, Marshall County, March 3rd and 4th, 1899.
Elm Grove, Ohio County, March 6th and 7th, 1899.
Cameron, Marshall County, March 8th and 9th, 1899.
New Martinsville, Wetzel County, March 10th and 11th, 1899.
Middlebourne, Tyler County, March 17th and 18th, 1899.
St. Marys, Pleasants County, March 20th and 21st, 1899.
Williamstown, Wood County, March 22nd and 23rd, 1899.
Elizabeth, Wirt County, March 24th and 25th, 1899.
Belleville, Wood County, March 27th and 28th, 1899.
Spencer, Roane County, March 29th and 30th, 1899.
Ravenswood, Jackson County, March 31st and April 1st, 1899.
Martinsburg, Berkeley County, April 19th and 20th, 1899.
Charles Town, Jefferson County, April 21st and 22nd, 1899.
Berkeley Springs, Morgan County, April 24th and 25th, 1899.
Romney, Hampshire County, April 26th and 27th, 1899.
Burlington, Mineral County, April 28th and 29th, 1899.
Moorefield, Hardy County, May 1st and 2nd, 1899.
Petersburg, Grant County, May 3rd and 4th, 1899.
Upper Tract, Pendleton County, May 5th and 6th, 1899.
Franklin, Pendleton County, May 8th and 9th, 1899.
Ansted, Fayette County, May 17th and 18th, 1899.
Lewisburg, Greenbrier County, May 19th and 20th, 1899.
Union, Monroe County, May 23rd and 24th, 1899.
Alderson, Monroe County, May 26th and 27th, 1899.
Hinton, Summers County, May 29th and 30th, 1899.
Forest Hill, Summers County, May 31st and June 1st, 1899.
Athens, Mercer County, June 2nd and 3rd, 1899.
Beckely, Raleigh County, June 6th and 7th, 1899.
Fayetteville, Fayette County, June 9th and 10th, 1899.

We hope for much assistance from the members of this Board and from the Director of the Experiment Station and members of his staff.

Before closing this report, I desire to express to one and all my sincere thanks for their assistance in this work, and to the members of this Board for their kindness and courtesy to me at all times.

Respectfully,
C. C. BROWN,
Institute Director.

The Board convened again at call of President on Saturday, February 11th, at 9 o'clock A. M.

Prof. T. C. Atkeson read the following paper on the Teaching of Elementary Agriculture in the Public Schools:

GENTLEMEN:—As far back as 1873 I advocated the teaching of elementary agriculture in the country public schools of the

State, and on numerous occasions since, in the Grange, before this Board and many assemblies of farmers, and in the agricultural papers I have had occasion to repeat the argument. On several occasions this Board has put itself on record as favoring the same idea. As a pioneer in the advocacy of this idea, I have been much gratified by the popular hold it seems to have taken upon the advanced educational thought of the country during the last two or three years. Every kind of farmers' organization is demanding it. The National and many of the State Granges have recently endorsed it. The Master of the National Grange, Hon. Aaron Jones; the President of the National Farmers Congress, ex-Governor Hoard; the Secretary of Agriculture, Wilson; Governor Mount, of Indiana, and scores of others who stand in the front rank of agricultural thinkers, now advocate it. New York, and possibly some other States, has already made large appropriations for the purpose of teaching "nature studies" in the public schools. Dr. Roberts, of Cornell University, is an enthusiastic friend of the movement. Within the last twelve months a sentiment in favor of the plan has swept over the country from one end to the other, and it now seems certain that, in one form or another, elementary agriculture will soon be taught in the public schools of many, if not all, of the States, and I would recommend that this Board investigate the matter fully, and use its influence to secure the legislation necessary to provide for the teaching of "nature studies" and the elementary science of agriculture in all our public schools. The progress of the times demands it, and the importance of the profession of agriculture will justify it. I know of nothing that would do so much to elevate our farmer people and add respect and dignity to the most important of all occupations as the recognition, by the State, of this demand for special education. In compliance with the resolution of the Board, requiring each member to make some kind of a written communication at each meeting, I deem this subject of paramount importance, and therefore present it. If this Board can secure this reform movement, it will accomplish the most important work that it has ever undertaken.

The Secretary asked permission to read a communication received from the Hon. Alexander Clohan, ex-member of the Board, which conveyed the kindest greetings and suggestions, and was listened to with a great degree of interest. Another letter was read by the President from H. W. Miller, regretting his inability to be present with the Board on account of sickness. Mr. L. M. La Follette, State Auditor, then came before the Board to audit accounts. The following resolutions were adopted:

*Resolved*, That the President and Secretary of this Board draw a requisition on the Auditor, payable to the treasurer of this Board, for the full amount of all appropriations that may be found to remain to the credit of the State Board of Agriculture previous to the first day of October, 1898.

*Provided*, That the appropriation for contingent expenses shall be paid to the treasurer of the said Board in sums not to exceed five hundred dollars $(500.00), and by him disbursed under the order of the Board; but before anything is so paid, the treasurer shall execute a bond in the penalty of one thousand dollars ($1000.00) with good security. to be approved by the Board, entered of record by it, and filed with the Auditor of the State all disbursements by the treasurer to be made upon a proper requisition of the Board, signed by the President and Secretary.

*Resolved*, That the State Board of Agriculture heartily indorse House Bills Nos. 51, 72 and 78, and express the hope that they may be favorably acted upon.

*Resolved*, That it is the sense of the State Horticultural Society, that with the concurrence of the State Sheep-Breeders and Wool Growers' Association, The State Grange, the State Board of Agriculture, and the State Farmers' Institute, that the President and Secretary of each association, constitute a Conference Committee to arrange the place and date of all annual meetings.

On motion, the President, Secretary and Institute Director were appointed a committee to contract for the printing of the Review, and renew contract with the Experiment Station for space in Review.

The Board adjourned to meet at Morgantown, June 19, 1899.

# MEETING OF THE BOARD AT MORGANTOWN, W. VA., JUNE 20, 1899.

In response to an invitation given by the Faculty of the State University to the Board of Agriculture, to hold its meeting in Morgantown during Commencement week, the Board convened in its seventeenth semi-annual session in the Agricultural Hall, at nine o'clock A. M., on the above date, the President, S. W. Atkinson, in the chair.

The following members were present: S. W. Atkinson, J. M. Sydenstricker, J. Q. Rathburn, H. W. Miller, T. C. Atkeson; D. M. Sullivan, Secretary.

The President called for the minutes of the previous meeting, which were read and approved.

The Secretary's report was then called for, which was read, and is as follows:

## REPORT OF SECRETARY.

Notwithstanding the work of the Board has been progressing quite satisfactorily since our last meeting, we have had some difficulties to contend with. The Public Printer entered suit against this Board in the Supreme Court of Appeals to compel us to purchase our printing and stationery from him. It was his intention to make this suit a test case, as there are sixteen departments of State that would have been affected by this decision, if it had gone against us, amounting in all to about $10,000 annually to him. Scarcely one of these departments realized to what extent it would have been inconvenienced if this suit had gone against us—to say nothing of the extra cost if not permitted to contract work with the lowest bidder. It would have cost the State Board of Agriculture between $400 and $500 yearly, more than it does, to get our printing done. As we have explained to you by letter, we were compelled to assume the responsibility of employing counsel and defending this suit. We employed General Watts and Ashby, who successfully gained the suit for us. We would recommend that this Board and each of the departments which this suit would have affected, show their appreciation of the services of General Watts by paying him a reasonable compensation, as we have serious doubts if any other lawyer could have succeeded as well.

At our last meeting we were instructed to place a subscription price of twenty-five cents upon the Farm Review and make application to the Postoffice Department for it to be admitted as second class matter, which we did, and were rejected on the ground that our subscription was too low, yet there was one good resulted from this effort: In sending in their subscriptions we were enabled to learn to what extent the Review was read and appreciated by our friends, which was very gratifying. From the many letters we receive, we learn that our farmers are reading more than ever before.

The closing of the year 1898 found this Board with thoroughly matured, well-laid plans, waiting the support of the Legislature with an appropriation sufficient to enable us to carry on the work most effectually. Although the Legislature did not appropriate the amount which was absolutely necessary to do the amount of work which is so badly needed, yet we are better prepared financially than ever before to push and expand our work. We are not only anxious to do a great work, but it is expected of us by our people that we press forward and occupy ground with our work generally that we have not been able to work before. The report of our Institute Director will enable our people to see that we are possessing the move-forward spirit. The institute is *the* work of the Board and should be the burden of each members' desires. We can afford to learn lessons from those who have had the experience and are making a success in agricultural education. Without one single exception they place great stress on the institute. It is here they are enabled to come in contact with the farmers. What the district school teacher is to our institutions of learning, the institute work is to the agricultural education of our farmers.

Germany, in her shrewd foresightedness years ago, saw that an agricultural education of her husbandmen was a paramount necessity, and gives every support to the institute work. As the work of this Board increases, our individual responsibility increases proportionately. Your Secretary realizes this to an extent bordering on embarrassment. There is no man worthy a position connected with this Board in any way who would be satisfied with its work being second to any department of like purpose in the United States. Looking at the matter in this light, we realize there is no time to be idle.

Our Fourth Biennial Report seems to be giving pretty general satisfaction, as we have received numerous letters of congratulation, saying it contained much valuable information of the character that people of other States are desirous to learn as to the resources of our State.

As was directed by the Board at its last meeting, the President, Secretary and Institute Director, advertised for bids for the printing of The Farm Review. The Donnally Publishing Company's bid being the lowest and most satisfactory, was accepted and the contract signed with said Donnally Publishing Company, who are doing the work quite satisfactorily.

The Treasurer of this Board presented the State Auditor with a one thousand dollar ($1,000.00) bond, conditioned according to law, which was accepted by him as satisfactory.

The State Grange appreciatingly accepted space in the Review, appropriated to them by you at your last meeting. Following is a statement of our finances to May 30th, and we ask the President to appoint a committee to audit the same.

Respectfully submitted,

D. M. SULLIVAN,
Secretary.

## REPORT OF INSTITUTE DIRECTOR.

*(January 1st, 1899, to June 15th, 1899.)*

Since my last report to you, we have held, under your auspices, thirty-one very successful meetings, besides a number of district institutes, which, for lack of full information, we do not report to you.

We have encountered a good many difficulties and hindrances, such as a lack of interest in some sections, floods, impassable roads, and later the extreme rush of farm work among the belated farmers.

Notwithstanding these hindrances, we think we are fully justified in reporting the institute work in good condition, with many more willing and well equipped workers than ever before.

This work, so well begun, should not be allowed to languish or lag, but should be intelligently and persistently followed up, and the aim should be to render more and better service each succeeding year. All these meetings are attended by from one to four representatives of your Board, and nine of them by the Director, or some member of his staff from the Experiment Station, at Morgantown.

It is a matter of regret to me, and to the people generally, that we can not have one member of the Station with us at each meeting, and we hope you may be able to secure such service for our future meetings. We are confident that such an arrangement would not only very satisfactory and pleasing to the people; but would create a much more general interest in the work of both departments, and thus place us all in a better position for effective work in the future.

The total attendance at these thirty one meetings was about 6,000, or an average of a little less than 200, and whether the crowd was large or small, the interest was good—very good—and many very important subjects were ably and freely discussed.

Up to the present time, meetings have been held in forty-one of our fifty-five counties, and arrangements are already well under way for the remaining fourteen counties, and they will be reached before the close of the present fiscal year—September 30th.

The meetings for these fourteen counties are being arranged as follows:

Middlebourne, Tyler county, July 26th, 1899.
Buckhannon, Upshur county, July 28th, 1899.
Summersville, Nicholas county, August 8th and 9th, 1899.
Clay C. H., Clay county, August 12th, 1899.
Madison, Boone county, August 15th, 1899.
Ansted, Fayette county, August 17th, 1899.
Hurricane, Putnam county, August 22nd, 1899.
Milton, Cabell county, August 23rd, 1899.
Hamlin, Lincoln county, August 24th, 1899.
Barboursville, Cabell county, August 26th, 1899.
Wayne, Wayne county, August 28th, 1899.
Welch, McDowell county, Septenber 6th, 1899.
Oceana, Wyoming county, September 8th, 1899.
Williamson, Mingo county, September 11th, 1899.
Logan, Logan county, September 13th, 1899.

When these meetings shall have been held, it will make a total of sixty-seven meetings during this fiscal year—October 1st, 1898, to September 30th, 1899, and will complete the itinerary, giving to each county at least one meeting, and to ten of them, two meetings.

At the meetings yet to be held this year, we hope we may have with us one member of the Board, and one member of the Station Staff, as the people need them, expect them, and should not be disappointed.

This being the first meeting of your Board at which I have not had the pleasure of meeting and mingling with you since May, 1893, I very naturally feel a deep interest in all that you may do, and I sincerely hope you may plan largely and execute wisely, and that all your undertakings may be crowned with abundant success.

I trust your present meeting may be a pleasant and profitable one, and that each of you may return to your respective homes, with a full determination to push the important work committed to your care to final triumph and complete victory.

My greetings to you—and thanks for the kindness and courtesy with which you have uniformly treated me.

Respectfully submitted,
C. C. BROWN,
*Institute Director.*

After the disposition of some important business of a miscellaneous character, the Secretary was ordered to issue a check to J. B. Garvin, of Wheeling, for ten dollars, balance due him for animals destroyed by direction of the Board.

J. M. Sydenstricker and H. W. Miller were appointed as a committee to audit the account of the treasurer. Mr. J. M. Sydenstricker then made a statement regretting his inability to accompany the Secretary and Mr. James George at the institutes held at Forest Hill, Athens, Beckley and Fayetteville.

T. C. Atkeson and the Secretary were appointed a committee to confer with the Board of Regents of the State University, regarding the fee claimed by C. C. Watts for defending the suit in the Supreme Court of Appeals, instituted by the Public Printer, to compel the State Board of Agriculture to purchase said Boards' printing and stationery from said Public Printer.

Prof. T. C. Atkeson spoke on the subject of an effort recently made to secure admittance through the mails of the Review as second class matter. He informed the Board of Dr. Ruhl's appointment on the Faculty of the University as the head of the Veterinary Department, and urged the members of the Board to bring this matter before the farmers and encourage them to patronize this Department, and take the twelve weeks' course beginning the first week in January. Dr. Ruhl being present, expressed his thorough appreciation of the kind treatment of the Board and assured them of his gratitude. Mr. Sydenstricker spoke on the subject of an anniversary meeting next fall, of the State Grange, the State Horticultural Society, the Sheep Breeders' and Wool Growers' Association, and the State Board of Agriculture, in response to an invitation extended by the people of Greenbrier county, to hold these meetings in conjunction at Lewisburg, and suggested that this Board take the matter into consideration.

Dr. Ruhl then made an explanation regarding a controversy between himself and Prof. White, concerning a cow belonging to the latter gentleman, which the Doctor had treated.

The Board then took a recess until 2 o'clock P. M.

The President then called the Board to order at 2 o'clock. The first business claiming the attention of the Board was the consideration of a letter received from Samson Snider, of Harmon, describing a disease prevalent among the cattle in his vicinity, and calling on the Board to take some action toward its control. On motion, the President was instructed to take the matter under consideration, adopting such methods as he deemed best for its extinction.

The President and T. C. Atkeson were appointed a committee to formulate rules for the enforcement of the law relating to diseased animals. Mr. Sydenstricker introduced again the subject of institute work, which was discussed by all present. The necessity of sending our farmers' sons to the Veterinary Department of the University, was discussed, and it was decided to agitate the subject at our Farmers' Institutes.

On motion Dr. F. P. Ruhl's account for doctoring Prof. White's cow was allowed. He was then directed to go to Union, to quarantine some cattle which had been reported as being afflicted with hydrophobia.

The Board then adjourned to meet at nine o'clock next morning.

The Board again convened at ten a. m., Wednesday. The institute work was again the subject of discussion. It was decided best to make the following changes in our present methods of conducting institutes, as soon as practicable: 1st. To divide the State into districts. 2d. To confine the time of holding institutes to the winter, fall and spring, and attempt to hold any meetings in the busy summer season. 3rd. That the members of the Board make it a point to exchange work with each other so that the same member may not be at any one place oftener than may be prevented.

On motion, Mr. Sydenstricker was appointed to formulate a plan for holding institutes, and present it the Board at its next meeting. The following resolution was then offered by T. C. Atkeson:

RESOLVED, That when we adjourn, it be to meet in Charleston, October 13th, 1899, and hold a two days' session previous to going to Lewisburg, and that this Board recommend the following schedule for holding other State Associations at Lewisburg or any other place which may be hereafter decided upon:

Tuesday, Oct. 17th, State Horticultural Society.

Evening, Oct. 17th, State Farmers' Institute Society.

Wednesday, Oct. 18, State Sheep Breeders' and Wool Growers' Association.

Thursday and Friday, Oct. 19th and 20th, State Grange.

Mr. Sydenstricker and the Institute Director were then appointed a committee to arrange for institutes following the meetings at Lewisburg, for the remainder of October and November.

The Board took a recess until 2:30.

The Board convened at 2:30 p. m.

J. M. Sydenstricker and H. W. Miller, who had been appointed to audit the accounts of the Treasurer, made the following, report: "We your committee, find the financial account of the Treasurer to be correct." "Said report was accepted and committee discharged.

Director of the Agricultural Experiment Station J. H. Stewart came before the Board to discuss the advisiablity of representing the Experiment Station at the institutes. He expressed himself as being in hearty sympathy with the Board and its work, and announced his willingness to co-operate as far as possible.

The Board of Regents of the West Virginia University notified the Board of Agriculture that they were in session, and invited them to meet with them to consider the amount each department was expected to pay General C. C. Watts for his defense of the suit instituted in the Supreme Court of Appeals by the Public Printer, to compel the different Departments to purchase their stationery of him and employ him to do their printing. The Board accepted the invitation and went in a body, and Prof. Atkeson stated briefly the facts in the case. Mr. Sturgiss then addressed the joint assembly and in a very concise and agreeable speech expressed the sentiments of the Board of Regents toward the Board of Agriculture and assured them of their hearty and sincere co-operation.

A motion was made to pay C. C. Watts $75 as the fee from the Board of Agriculture.

Member J. Q. Rathburn then delivered his farewell address, which was ordered to be published, and is as follows:

Mr. President and Members:—As I retire from this position representing a profession which has no peer throughout all this broad land, I might perhaps fairly congratulate myself upon having had the opportunity to administer an office full of grave responsibilities, which are the conditions that hover over our noble profession, without fear, favor or reward. Where I have succeeded I am sure to have your generous and final approval. Where I have failed, I am also sure you will award me credit for honorable intentions. Notwithstanding any difference of opinion of party, you have shown me a degree of confidence and respect in all which pertains to our duties, as one of your associates in a manner so full and ample that my pleasant recollection of it will never pass away. When I compare the opportunity you give me with what it has been possible to do, I see how much I need your kind and generous indorsements of to-day, for which I return, with a grateful heart, many thanks. With pleasant memories for our past, which I shall always cherish, and best wishes for your future success as a Board and individually, which I shall always entertain, I bid you farewell.

After considering some business of minor importance, the Board adjourned to meet in Charleston, October 13th, as previously decided upon.

# PROCEEDINGS OF THE SEMI-ANNUAL MEETING OF THE BOARD, HELD AT CHARLESTON, OCTOBER 13, 1899.

The State Board of Agriculture convened in 18th semi-annual session at 2 o'clock P. M. in its rooms in the State House on the above date. The following members were present:

S. W. Atkinson, President.
H. W. Miller, and
James George.

The minutes of the previous meeting were called for, read and approved. The report of the Secretary was called for, which was read, as follows:

### SECRETARY'S REPORT.

*Mr. President and Gentlemen of the State Board of Agriculture:—*

This closes my term of office as Secretary to which you so kindly elected me on October 1st, 1897, for two years. With the exception of some degree of embarrassment in familiarizing myself with the work of the office, this two years has been very pleasant and agreeable.

My work in the office—the publishing of the Review—and the little assistance given the Institute Director—have all furnished me great pleasure as well as profit. The correspondence of the office is increasing in volume and becoming more and more practical, and naturally more difficult, requiring more and more attention. This in itself is encouraging evidence that the Board is doing well its part, and growing influential and taking its rightful place among the enterprising boards of the states.

The Review continues to grow in favor with our farmers and is being read by them with a great deal of interest, and when we remember that each issue is a first-class institute in the homes it enters all over the State, we can form some idea as to its influence among our people. We have endeavored to collect material which will make it strictly an educational paper, and we would recommend that you appoint a Committee to secure the admittance of the Review to the Post Office Department, allowing it to pass through the mails as second-class matter, which would be a saving of about sixty dollars per month to the Board. When I was elected Secretary two years ago, the office of Institute Director was created, and plans matured for more thorough and aggressive work, and the amount of work which has since been accomplished can be ascertained by reference to the Report of the Institute Director. As you are all aware, this Board has come to the point in its existence which makes it almost absolutely necessary for it to use its influence for a State Fair in order to promote and complete its undertakings. We would recommend that this subject be discussed at our institutes and agitated from this time until the convening of the next Legislature, when we have no doubt it can be prevailed upon to make an appropriation for this purpose, if properly managed.

We would also recommend that you pass on the claims for the stock which has been destroyed at the direction of the Board, which amounts to $1,310.50, and pay to each person his proportionate share of the $703.00, which remains to their credit. The appropriation for the destruction of diseased animals is small, and it is very imperative that this branch of the work be pushed vigorously.

This Board has reached the point where it will require great effort from all connected with it to push the work, in order to keep the work from pushing the Board. The work must be driven or it will surely drive you, and this condition cannot exist long before both would come to a standstill. You will see by reference to our financial statement, there is not a department in the whole State which has used more economy in the expenditure of its money, than your Board has done. Yet, it is possible to carry even economy to extremes, thereby placing a limit to the work and influence of the Board. You have to your credit in the general fund a balance of $2,992.95. Also, $703.00, for the destruction of diseased animals; and deficiency to pay for animals killed $12.00.

As the patrons of husbandry have been the pioneers of agricultural education, and are giving substantial aid to this Board in its noble work at present, I have taken the liberty of furnishing the Secretary of the State Grange with the stationery necessary for his correspondence, paying the same out of your incidental fund. As the amount is very small, we would recommend that the favor be continued. If you should decide otherwise, we beg pardon for the liberty taken.

Finally, brethren, you will excuse me if I offer a suggestion as to my successor: There is no man perfect. Not a single man can assume the work of this office and do it satisfactorily to all concerned therefore, if you would have an efficient Secretary, you will of necessity be complled to assist him with your sympathies and suggestions. Give him to understand that you are in entire sympathy with him and with the work he is doing for you, as there is nothing better adapted to kill his influence and embarrass him more than to criticize him behind his back.

Respectfully submitted,
D. M. SULLIVAN,
Secretary.

The report of the Institute Director was called for, read and approved.

### REPORT OF INSTITUTE DIRECTORS.

(June 15th, 1899, to October 1st, 1899.)

GENTLEMEN OF THE BOARD:—Since my last report to you (June 15th, 1899,) 15 Farmers' Institutes have been held under your auspices, besides a few district meetings in several sections of the State. This makes a total of 67 institutes this fiscal year—October 1st, 1898, to October 1st, 1899,—one in each of our 55 counties and two in 12 of them. A fair estimate of the number of persons attending these meetings is placed at about 14,000, or an average of something over 200. On the whole, we regard the work in good shape, although there are some sections in which little interest is manifested by the local farmers and friends.

We have also reached the conclusion that we should avoid the larger towns, and go only to such places as are not overrun with public meetings and where the institute will prove the chief attraction and where the interest will not be broken into by disinterested parties, who come and go at will. It is important that the best possible interest be secured at each meeting.

Each of the meetings held has been attended by one or more members of the Board and a few of the meetings by representatives from the Experiment Station, and it is a matter of general regret that the Station has not been represented at each and every one of these institutes.

It is desirable that at least one member of the Board, in addition to the Director, should attend each meeting, and that the members change territory from time to time, so that all may be given an opportunity to hear the different members and form their acquaintance; and that the members may acquaint themselves with the different conditions in the different counties of the State.

It is also very desirable that the Station be represented at each institute meeting, as well as the consulting veterinary surgeons.

The institute work should be vigorously pushed, and the efficiency of the service increased as rapidly as it can be done with the amount of money at your command for this purpose. I trust you may plan wisely and execute well.

Thanking you one and all for past courtesies.

Respectfully,

C. C. BROWN.

The secretary then read the minutes of the called meeting at Buckhannon, which are as follows:

BUCKHANNON, WEST VA., October 2nd, 1899.

In compliance with the call of the president for a meeting to be held at the above-named place and date, there not being a quorum present, the Board stood adjourned to meet again at Charleston on October 13th, 1899.

The financial statement of the secretary and treasurer was read and the president appointed H. W. Miller and James George to audit said account. After carefully inspecting the account they reported it to be correct. The report on the animals destroyed according to the direction of the Board, was called for and after going over said list the secretary was directed to issue certificates to the owner of said animals pro-rata as to the amount remaining in the fund for that purpose on the 1st of October, 1899.

C. C. Brown reported some suspected cases of Tuberculosis near Cowen in Webster County. The Board directed C. C. Brown to write Dr. Ruhl to go to Cowen and make examination on the 19th inst. The secretary read the following report by Dr. F. P. Ruhl:

MR. D. M. SULLIVAN,
Secretary State Board of Agriculture,
DEAR SIR:

At the meeting of the State Board of Agriculture held at Morgantown, I reported verbally regarding some cattle affected with Rabies, and was instructed by the Board to examine and if necessary to quarantine.

On arriving at Mr. Hayhurst's place in Union District, Marion County, I found a dead cow with the history that she had been bitten by a rabid dog (the dog was known to me and from symptoms I have no doubt in saying he was rabid), and that a calf was also bitten. I ordered the cow buried, and quarantined the rest, however taking the precaution to separate three calves which were with this cow from the others, and left orders to be notified in case any more were taken sick. A week after I had ordered these cattle under quarantine and this cow buried, the county court passed an order requesting the physician of the County Board of Health to take charge of the matter rather than have any reflection cast upon the State Board of Agriculture, I went to Dr. Jamison, the physician of the County Board of

Health, and told him I had charge of the Hayhurst cattle, and he and I both went out to see if the cow had been buried as I had previously directed, and found there had been no cause for complaint. About the second week in July I was told that Hayhurst was trying to dispose of his calves to a butcher. I went to President Atkinson and he told me to send Hayhurst a copy of the law, and promised to go out to Hayhurst's with me if I thought it necessary. As I had already sent the owner a copy of the House Bill, I did not think it any use to send him another, but took a constable and drove over to his farm and found that one of the calves had developed a case of Rabies. He had sent for me but I had started to his place before I had received the message. I had the calf killed and buried and cautioned the owner that he would be prosecuted if he attempted to dispose of his stock. Two weeks later another calf was taken and I was sent for again, and had it destroyed and buried. On August 20th the owner came to me and requested me to examine the rest of his stock and give a release if I found his cattle all right. On August 22nd, I released his cattle from quarantine, being sixty days from the time first cow was killed.

Now, while I had no other instructions from the Board, other than the letter from President Atkinson, I proceeded with this matter hoping the Board would have approve all I had done. This same man was mixed up in a sale of a steer with a Sarcoma Cancer on the upper jaw, but fortunately I met him as he was driving it to a slaughter house to a prominent butcher. I stopped the butcher from slaughtering the animal and had it released to the original owner, who I understand, has since sold it in Pittsburg.

I have just returned from Paw-Paw District, Marion County, where I destroyed a two-year-old steer belonging to Robert Talbott. He had lost three steers and all had died in about the same manner. On examination I found a well developed case of Rabies. I had the cattle quarantined. I expect more trouble in this vicinity as I have heard of at least five dogs that have died with rabies within a mile of his farm. This section I am told is leased to a club that uses it for fox-hunting and here may be the source of contagion.

A Mr. Heck has lost a cow in the same manner, but I did not see it. It is in the same neighborhood.

Hoping the Board will have a pleasant and profitable meeting, and will approve of what I have done in this matter, I remain,

Yours very truly,

F. P. RUHL,
Consulting Veterinarian.

The following resolution was read and adopted, and is as follows:

WHEREAS, The Board of Agriculture of the State of West

Virginia, has recently been in litigation in the Supreme Court of this State, with the Public Printer and Public Stationer, in which litigation, effort was made by mandamus preceedings to compel this Board, to buy all its stationery and have all its printing done by and through said Public Printer and Public Stationer, which litigation was decided against said Public Printer and Public Stationer, and;

WHEREAS, It became necessary in said litigation for said Board of Agriculture to employ counsel to appear in said litigation and protect the rights of said Board in said litigation, and,

WHEREAS, Said Board did employ the law firm of Watts & Ashby, to protect the interests of said Board, which said Watts & Ashby did with absolute success and to the entire satisfaction of this Board, and,

WHEREAS, The fee to be contracted to be paid to said Watts & Ashby, contingent upon their success, was the sum of five hundred dollars, and they further agreed that they would accept such part of the five hundred dollars fee from this Board as it might determine was a fair proportion of said fee, and that they would depend upon the other State boards for the remainder of the amount. After investigation and consideration of the whole matter this Board decided that seventy-five dollars would be a fair and equitable proportion, and that amount was paid and accepted by the said law firm of Watts & Ashby in full payment of the obligation of the State Board of Agriculture; therefore, be it

*Resolved*, That the Secretary of this Board be and he is hereby authorized and directed to inform the various boards of the State of the matters hereinbefore set out of the result of said litigation, the employment of said law firm, of the fee that is still due it—the sum of four hundred dollars—(this Board having paid the sum of seventy-five dollars itself and the Board of Regents at Romney having paid the sum of twenty-five dollars) and requesting said boards to make provision for the payment of such amounts as they may be willing and consider just to pay on said sum of four hundred dollars, which the said Watts & Ashby have fairly earned and are entitled to, for their prompt, efficient and successful management of said litigation.

*Resolved*, further, that the Secretary of this Board be directed to send a copy of this resolution to the president of each of the said boards of the State for such action as said boards may be pleased to take in respect thereto.

After some miscellaneous business, the Board took a recess until 7.30 P. M.

The Board convened again at 7.30 P. M., and the subject of diseased animals was taken under consideration, and after discussion of same the President appointed H. W. Miller to prepare in writing rules to be governed by in the disposition of all such animals as may come to the attention of the Board and present said rules to the Board at its next session.

The Board adjourned to meet at 9 A. M. next day.

The Board convened again Saturday, October 14th, at 10 A. M. All the members were present.

J. M. Sydenstricker, who was appointed committee to formulate plans for the holding of institutes reported. On motion, Mr. Sydenstricker was continued on same committee, with the addition of James George, to report plans to be presented at some future meeting of the Board.

On motion, the Board proceeded to the reorganization and to the election of officers for the ensuing two years.

H. W. Miller was elected Secretary *pro tem.*

J. M. Sydenstricker suggested they vote by ballot, which plan was unanimously agreed to.

The vote for President came first, and was as follows:

| | |
|---|---|
| S. W. Atkinson | 4. |
| J. M. Sydenstricker | 1. |

S. W. Atkinson was declared re-elected.

The President made a neat and appropriate speech of acceptance.

The vote for Secretary was next in order, and resulted as follows:

| | |
|---|---|
| J. B. Garvin | 3. |
| D. M. Sullivan | 2. |

J. B. Garvin was declared elected.

The election of Institute Director was next in order.

On motion of H. W. Miller, seconded by James George, the election of Institute Director was postponed until the meeting at Lewisburg.

The Board then adjourned to meet at 9 A. M. on Monday, October 16th.

The board convened Monday, October 16, 1899, and was called to order by the President.

It was moved and carried that the present consulting members of the State Board of Agriculture be reappointed for the term of two years, beginning October 1, 1899, with the addition of the following names: S. E. Hershey, Veterinarian, Keyser; Selmon Wells, Dairyman, Josiah; W. A. Thatcher, Aparian, Martinsburg; and Wm. F. Brown, Pomologist, Arroyo.

There being no other business of importance before the board, it was decided to adjourn to attend the joint meetings of the State Horticultural Society, State Wool Growers and Sheep Breeders' Association and the State Grange, which meets at Lewisburg, October 17, 19 inclusive, and to meet in session at the call of the President. Before adjourning however, it was decided that D. M. Sullivan, former Secretary, continue to serve until the close of the session to be held at Lewisburg, and that he be allowed his regular expenses and salary, and that J. B. Garvin, Secretary-elect be allowed the necessary expenses incurred while attending said meeting.

The board then adjourned to meet at Lewisburg, at the call of the President

LEWISBURG, October 18, 1899.

The board re-convened with all the members present. On motion the secretary was instructed to pay Mrs. Brown, for special work done, the sum of $10.00 making in all $40.00

Some time was then devoted to the discussion of institute work among the farmers, and the most practical and economical plan of carrying on the work was considered. The feasibility of changing the present plan of conducting the work was discussed at some length, but no definite action was taken. It was finally decided to elect an Institute Director for the term of one year, beginning October 1, 1899. A motion prevailed that the voting be done by ballot which resulted as follows: D. M. Sullivan received three votes and two ballots were voted blank. D. M. Sullivan was declared elected.

On motion J. B. Garvin was elected Treasurer of the State Board of Agriculture, for the term of two years from October 1, 1899, to succeed D. M. Sullivan, former Treasurer. As Treasurer, he was instructed to file a bond of $1,000.00 with the Auditor.

The board then adjourned to meet in semi-annual session the first Monday in April, 1900, at such place as the President might designate.

## MINUTES OF THE 19TH SEMI-ANNUAL MEETING.

April 2, 1900.

The regular 19th semi-annual meeting of the State Board of Agriculture met in its office in the Capitol at 10, a. m., and was called to order by the President. All the members were present except Mr. Sydenstricker, who was reported sick and unable to attend. The first business in order was reading and correcting the minutes of the last meeting.

The report of officers was next called for. The President made a verbal report and spoke of some matters that had been looked after since the last meeting and particularly what had been done to prevent contagious diseases among domestic animals.

The Secretary's report was called for, read and approved.

### SECRETARY'S REPORT.

Mr. President and Gentlemen of the State Board of Agriculture: In presenting this my first report for your consideration, I shall try to present such facts as have come under my observation during my short experience as your secretary, and some thing I hope you may deem worthy of consideration. I am deeply impressed with the work of this department, and the more it is studied the more convincing it appears, that the trust committed to your care is one of considerable magnitude, having much to do with developing the material as well as the agricultural resources of the State. It would be difficult to estimate the good results of the work already accomplished by this department, and we feel warranted in saying, that the agricultural conditions in the State today, are far in advance of what they were when the State Board of Agriculture was first established, and we believe these changed conditions are chiefly due to the efforts of this board.

In addition to the manifest interest aroused among the farmers in the direction of more scientific and better farming, there also seems to be a great deal of interest in the States resources outside our borders, if we are to judge by the bulk of correspondence from this source.

This is an important part of the work and we have aimed to give it earnest and careful attention.

## FARM REVIEW.

In addition to the institute work among the farmers, it has been our endeavor to make the Farm Review form an important adjunct in educating the farmers up to the great needs of the day. How well we have succeeded we leave you to judge, and trust you will ever feel free to suggest such improvements as will assist in making the Review what it ought to be. I feel that the work is no small task if it is to be maintained at a standard that will benefit the farmer, and claim the respect of the state bureaus of agriculture in other States.

The Board at its last meeting having overlooked the fact that the contract for printing the Review would expire the December following, it was necessary to call your attention to the fact by letter, and having obtained your consent I proceeded to get bids, which were likewise submitted to you by letter for decision. Each member, except J. M. Sydenstricker, replying in favor of the Donnally Publishing Company. They were given the contract for the printing for four months. This contract expires with this (April) issue, and it now remains with you to appoint a committee to make a contract for the remainder of the year, or for such time as may be determined.

Should you decide upon any definite line of policy for the future of the Review. I respectfully ask that you consider the matter of improving it in so far as the means at your disposal will permit. One thing I might mention is a better grade of paper. As a State publication it would no doubt appear more becoming if this and a few minor details were decided upon. If the much-cherished desire could be reached that of having the Review mailed as second-class matter, a small additional expense could be profitably applied, I think, toward the material improvement of our publication. I very much regret having to report that the last attempt to secure a second-class rate of postage failed. I am sure it is a matter we are all very much interested in, but before it can be successfully accomplished, the issue will have to be reduced to the number that are willing to pay for it, except, perhaps, a few sent out as exchanges and sample copies.

The principal feature of the law barring the Review from entering the mail as second-class matter is found in Section 277, Postal Regulations, which reads as follows:

"Provided, however: That nothing herein contained shall be so construed as to admit to second-class rate regular publications, designed primarily for advertising purposes, or for free circulation, or for circulation at nominal rates."

The reply received by the postmaster in Charleston reads as follows:

"Referring to your application for entry of second-class matter of West Virginia Farm Review, you are informed that the Department cannot accept for mailing at second-class rates of postage any publication issued as this application shows to be; to-wit: 8,000 copies printed, of which number but 250 copies are sent to subscribers. Should a change be made in the manner of issue and circulation, a new application for entry will be given consideration.

"Signed, EDWIN C. MADDEN."

This being the view of the Postmaster General, it is apparent that some decisive change will have to be made in the manner of issuing the Review. Indeed, it would seem most just, aside from any other consideration, that if one pays for the paper all ought to pay, and I think it would be well for you to determine the proper steps to be taken in this matter.

## A QUARANTINE LAW.

I desire to call your attention to the advisability of encouraging the passage of a law that will protect our State against the importation of diseased animals, which would greatly assist the present law governing diseased animals within our State borders. While, perhaps, the diseases among our live stock are fewer and less disastrous than appears in other States, yet it is very necessary to use every precaution by adopting such rules and regulations as will the most expeditiously eradicate such diseases as now exist.

## REPORTS ON DISEASED ANIMALS.

I have received reports from the consulting veterinarian, Dr. F. P. Ruhl, of Fairmont, and the President of the Board, of diseases affecting domestic animals in some sections of the State, and considered contagious, such as glanders, rabies and tuberculosis.

Two cases were reported by Dr. Ruhl, which were appraised as provided by law, one being a yearling steer in Webster county, appraised at $5, and one brown mare at $25 in Monongalia county. These animals, after being appraised, were destroyed.

The President of the Board reported one bay mare appraised at $12.50 and destroyed, stating that the appraisers made no charge.

These cases require your approval that certificates may be issued for the same.

## PURE FOOD LAW.

I respectfully call your attention to the feasibility of having a pure food law placed on our statute books, in order that the various adulterated articles of commerce used as food, as well as feed stuffs for stock might in a large measure be restricted, if not entirely controlled.

Before the next regular meeting of the Board the work of compiling the Fifth Biennial Report will have to be completed, and if the Board has any suggestions to offer in regard to the plan to be pursued it will be proper to do so at this meeting.

I herewith submit a general financial statement covering the business transactions of this department for the past six months.

I have thus briefly mentioned some suggestions and submit them for your further consideration.

The report of the Institute Director was next called for, read and approved, and is as follows:

## REPORT OF INSTITUTE DIRECTOR.

(From October 1st, 1899, to April 1st, 1900.)

MR. PRESIDENT AND GENTLEMEN OF THE BOARD:—Owing to my short experience of six months in the institute work, I have an opportunity to learn to what extent the farmers are receiving the proffered assistance of the State Board of Agriculture through the institute work. It affords me much pleasure to report to you that the institute work is proving to be quite a success. In most of the counties visited the farmers are availing themselves of the opportunity to attend the meetings and exchange ideas concerning the modern methods of cultivation of the soil. Your Board has planned wisely and has laid well the plans of this important department, and as you are aware you have so far simply completed the foundation, you have every encouragement to proceed with the work so well begun. In this department you have originated a work second to none for the development of our little "Mountain State." The possibilities of the institute work among the farmers are as great as the hidden resources of the State, and therefore the obligations and responsibilities of the workers in this cause are correspondingly great.

I thank you one and all for the assistance and encouragement you have given me since I entered into this interesting field of work, and I beg to assure you it has all been highly appreciated.

I would also inform you that the institute work is to-day demanding your most serious thought and wisest consideration. In a great many of the counties where it is just introduced it requires great effort to create sufficient interest among the farmers to attend the meetings, but this difficulty is gradually and surely being overcome. On the other hand, several of our counties are so advanced in the good work that they are rising and demanding the very best lecturers to be sent them, and are expressing great eagerness for more knowledge and better information. This is what you desire, and it would be encouraging indeed if every county in the State were so awakened to its cessities.

There is work for all of us, and considerable pioneer work for some of us yet to do, while others can take care of the work which is farther advanced. We find there is no particular season suited to all the counties. Some prefer the winter months for holding the institutes while others prefer the summer season. The Legislature has made an appropriation for this Board, and it demands a judicious, economical expenditure of the same. If you expect the Legislature to maintain the Board, of course, every cent must be spent to the very best advantage. It is a pity we have not the means to place at least four extra men in the field and then the work could not all be done. Economy, like every thing else can be carried to extremes and hinder rather than advance the enterprise.

Thirty-eight institutes have been held since the first of October. As the weather and roads have been unusually unfavorable during the winter season, the number in attendance has been diminished on account of the fact, and had conditions been more favorable, there is no doubt in the world that the attendance would have been far in excess of even our expectations; because there is an awakening interest all over the State in this branch of work. There was a total of about 4,215 people, who attended these meetings, averaging about 111 to each institute. Several counties have held district institutes, which have not been included in my report.

Trusting that you may be permitted to not only carry but push forward the work you have so wisely inaugurated, and again thanking your for your courtesy and kindness to me, individually,

I am most respectfully,

D. M. SULLIVAN,
Institute Director.

Consulting Veterinarian, Dr. F. P. Ruhl, submitted a report, which was called for and read as follows:

### REPORT OF VETERINARIAN.

MR. J. B. GARVIN,
*Secretary State Board of Agriculture:*

I hereby submit to you my report for the past six months, October 1st, 1899, to April 1st, 1900. During this time, I have been quite busy investigating a number of cases of contagious diseases, of which individual reports have been sent in to you. I have also attended a few farmer's institutes, viz:

At Philippi, Barbour county.
Pruntytown, Taylor county.
Rivesville, Marion county.
Harrisville, Ritchie county.
Barracksville, Marion county.

The last one was an independent county institute. Besides this, I have answered a large number of letters of inquiry relating to diseases of farm animals. This correspondence has grown to such an extent that it has proven to be quite a task to keep up with it. Two years ago, the Board passed a resolution, it was published in the Farm Review at the time, that when immediate answers were requested of the Veterinarians the person seeking information should enclose or send a fee of one dollar. Strange to say, I have yet failed to see the first dollar, and in a majority of cases they even failed to send postage.

In respect to this part of the work, I suppose that owing to the fact, that I have come in closer contact with a greater number of the farmers of this State by attending farmer's institutes, the work of the Veterinarians of the Board is being appreciated more by the farmers and the natural growth of the work itself, would in a measure account for this increase. In a great many instances, unless an answer was sent immediately it would be useless to send the information. Therefore, I have sacrificed my own time and convenience as well as the financial consideration to aid the work and further the interests of the Board; so that instead of being a gainer financially, I am at a loss unless the Board reimburses me for the postage used.

Last, in regard to my duties of inspecting animals with dangerous and contagious diseases, it is impossible for me to go on without stating that I have been seriously hampered in the performance of this work. Unfortunately for the people of this State, as well as myself, in some instances, where I have reported cases no action whatever was taken, and in other cases that were reported the matter evaded. In one case, an animal was destroyed without being examined by me, or any other Consulting Veterinarian, when it was reported by myself. This contrary to House Bill No. 72. And last, the delay in receiving authority to act in some cases has caused comment detrimental to the interests of the Board as well as dangerous to both the live stock and the people themselves.

For the services I have rendered, I have not received any compensation, or even allowed the actual moneys expended by me for railroad, hotel and incidental expenses, although requisitions were made out for the same, but the President refused to sign. Therefore not only have I given my services and time, but have had to pay out my own money to serve the State Board of Agriculture in the capacity of Consulting Veterinarian. Furthermore, unless the advice and recommendations of the Veterinarians are acted upon, their services to the Board can be of little help, and the title and position of Consulting Veterinarian to the State Board of Agriculture of West Virginia, is void of honor and responsibility.

Yours, very truly, FREDERICK P. RUHL.

A discussion of the report followed until the noon hour, when a recess was taken until 1:30 P. M.

The board reconvened at the hour appointed and the report of the veterinarian was again taken up. After thoroughly discussing the action of the veterinarian in the cases of diseased animals reported, it was on motion decided that Dr. Ruhl be allowed per diem and expense for the cases reported as follows: For visiting the cattle of S. C. Wood, near Cowan, Webster county, as instructed by the board at its last meeting, and applying the test for tuberculosis. The investigation proved that tuberculosis did exist and one animal was destroyed. For investigating and placing in quarantine a suspected case of rabies, reported from a district in Marion county, previously affected. For placing in quarantine and afterward destroying a case of glanders at Rivesville, Marion county, in which case the owner demanded no compensation. For investigating a case of tuberculosis in Marion county, from which disease the animal died during investigation. Also for investigating and destroying a case of glanders in Monongalia county.

A case of rabies being reported near Weston, Lewis county, Dr. Ruhl was instructed to communicate with the owner and if the disease was found to exist to proceed at once to make investigation.

It was decided to hold an evening session and a recess was taken until 7 o'clock P. M.

The board convened promptly at the appointed hour, and after the call to order, proceeded to consider the plan to be pursued in printing and issuing the Farm Review for the remainder of the year. The matter of subscription was reconsidered and discussed at some length, and also the advisibility of confining the circulation to the number of subscribers exclusively, and resulted in the following resolution being adopted: That we continue to publish the Farm Review as heretofore until Janury 1, 1901, and that the subscription price be continued at 25 cents for single subscribers, and in clubs of two 30 cents, in clubs of five 50 cents, in clubs of ten 75 cents and in clubs of 20 $1.00. The secretary was instructed to invite bids from such publishing houses as were equipped for doing the work.

The report of the committee on institute work was then called for. Mr. Sydenstricker being chairman of this committee and not being able to be present, a report was submitted by Mr. George the other member of the committee.

## REPORT.

*To the President and Members of the State Board of Agriculture:*

GENTLEMEN:—Your committee on Farmer's Institutes, would beg leave to submit the following report. That after a careful survey and study of the institute work in the State, we are of the opinion that the time has not arrived in the institute work throughout the State, when we could recommend a better method of work than is now inaugurated and in operation under the supervision of our institute director.

The only improvement that we have to suggest is the arranging of the counties into circuits as far as practicable, so as to do the greatest amount of work with the least expenditure of the limited appropriation at our disposal, and that we would instruct our institute director to arrange the counties of Hancock, Brooke, Ohio and Marshall, into a circuit and to call to his assistance a practical institute speaker from this State or a sister state, to be with him at the institutes held in the above named counties, and any other counties that have made sufficient, progress in the holding of farmers institutes throughout the State, and that the said speaker be paid not to exceed five dollars per day and actual expenses, while attending the said institutes.

Respectfully submitted,

JAS. GEORGE,

The hour for adjournment had arrived, but before adjourning, Mr. Sullivan, Institute Director, extended a cordial invitation to the members of the board to take dinner at his home the following day.

On motion the board unanimously accepted the invitation and adjourned to meet next day at 10 o'clock, a. m.

### TUESDAY, APRIL 3, 1900.

The board convened at the appointed hour, and after being called to order by the President, the report of the committee on institute work was again taken up. The plans set forth in the report were duly considered and suggestions of a progressive character discussed.

It was finally agreed to appoint two additional members on the committee to assist in arranging in detail more definite plans based on the suggestions set forth in the report. The report was finally accepted.

A motion provided that Mr. James George be retained on the committee with the addition of D. M. Sullivan and J. B. Garvin and requested to carry out the work on the lines suggested.

Bids having been received for printing the Review, it was decided to consider the various bids submitted by the different publishers. The Donnally Publishing Company being the lowest bidders, they were given the contract for printing the Review for the remainder of the year, extending to January 1, 1901, subject to a contract to be drawn up by a committee composed of D. M. Sullivan and J. B. Garvin. The noon hour having arrived the board took a recess for dinner.

## AFTERNOON SESSION.

The board convened at 2 o'clock, p. m. The members present were S. W. Atkinson, James George and J. C. Lewellen. T. C. Atkeson was compelled to leave for Morgantown, to attend to business in connection with the State University.

The first business taken up and considered was rules and regulations for carrying into effect, House Bill No. 72, passed February 24, 1899, regarding diseased animals. The rules presented for consideration numbered from one to seven. After considering one rule at a time in regular order, rules two and six were adopted, which read as follows: Rule 2 "When such quarantine is put into effect, the nearest and most accessible veterinarian shall have charge of all details, and shall see that such quarantine is respected and enforced, while operative, and to be raised by such veterinarian when he deems it safe and proproper. Rule 6. "The secretary of this board shall prepare a blank form for the reports of the president and the consulting veterinarians, subject to the approval of the board, which reports when filled out by the president and veterinarians shall show in detail what has been done, the time necessarily occupied in doing it, and the actual expenses incurred in each particular case. These reports shall be submitted to the board at its next ensuing meeting, and afterward kept on file in the office of the board by its secretary."

The committee appointed to draw up contract for printing the Review being ready, the report was submitted and approved, and the contract signed.

On motion a committee was appointed consisting of D. M. Sullivan and J. B. Garvin, to see that the contract for printing the Review be carried out to the letter, and if said publishers failed to comply with the terms of the contract, the said committee were empowered to make arrangements with any other printer they may select to do the work for the unexpired term.

The Secretary was instructed to prepare a blank form suitably arranged for reporting diseased animals, and after submitsing a form it was adopted, and he was instructed to have 500 printed.

The next biennial report was taken up and after some discussion, the plan suggested was finally adopted, and the Secretary requested to have it ready to submit for the inspection of the board at the October meeting.

The advisability of having a quarantine law placed on the statute books, to prevent the importation of diseased stock from other states, was considered and resulted in the appointment of a committee, consisting of the consulting veterinarians, Drs. F. P. Ruhl, Wm. Petrie and S. E. Hershey, to formulate a bill to bring before the next legislature.

The animals that had been appraised and killed and duly reported to the Secretary was next taken up. The yearling steer belonging to S. C. Wood, Cowan, which was properly appraised at $5.00 and destroyed October 27, 1899, was allowed, and the appraisers to be paid $1.00 each.

A brown mare belonging to Wm. W. Mathews, Morgantown, was appraised at $25.00 and destroyed February 6, 1900. After learning all the facts in the case, the appraisement was considered too high and the owner allowed $15.00 and the appraisers $1.00 each.

A bay mare belonging to J. H. McKinley, Lightburn, was appraised at $12.50 and destroyed January 2, 1900, which was allowed, the appraisers making no charge. The Secretary was instructed to issue certificates in each case as provided by law.

The President appointed a committee to audit the Secretary-Treasurer's account, and after going over the same it was reported to be correct.

The next business taken up was the matter of appointments. At the last meeting of the Board, W. A. Thatcher, Martinsburg, was appointed apiarin, and after having been duly notified of his appointment refused to accept. On motion, G. G. Naylor, Lockhart, was appointed to fill the place for the term of two years, or until October 1, 1901, and J. M. Carroll, Lewisburg, was appointed poultryman.

The Board then adjourned to meet September 25, 1900.

# PROCEEDINGS OF THE TWENTIETH SEMI-ANNUAL MEETING OF THE BOARD.

CHARLESTON, W. VA.,
Oct. 1, 1900.

The meeting was called to order at 2 o'clock P. M., President S. W. Atkinson in the chair.

Minutes of the previous meeting were read by the Secretary and approved.

### REPORT OF THE PRESIDENT.

*Gentlemen of the State Board of Agriculture:*

I have heretofore neglected the duty devolving upon me as the President of this Board, of making my annual report or address, and stating my suggestions and recommendations for its advancement and for the approval of its members: but as we meet to-day in our Twentieth Semi-Annual Session, I desire to give you a brief outline of our accomplishments, and of the conditions, as seen through my glasses, which are now confronting us.

In the first place, we as farmers follow the grandest and most honorable vocation which heaven vouchsafes man to follow; we earn our bread by the "sweat of our brow" and therefore appreciate our table dainties and luxuries, as well as the shade of our own "vine and fig trees," under which we rest when meditating upon our manifold causes for thankfulness and gratitude. We can afford to be as independent as was our grandfather Adam before the fall, if we do not abuse our privileges, and honor the "Bountiful Giver of All" by obeying his laws and abiding in his love. We are leading *busy lives,* as a farmer must if he is a successful farmer. The importance of the interests committed to the care of our Board demands our best efforts and can not be over-estimatted. The work of the Board has increased at a very rapid rate in the last two years, and as its usefulness increases there is a corresponding increase in the demands made upon it. In this age, characterized as it is by ceaseless and aggressive activity, we as sentinels cannot afford to sleep at our posts, but must keep abreast of the times as up-to-date, industrious farmers, allowing not the critics of other professions to ask in derision: "Why stand ye here idle?" If we fail in our duty we must, perforce, surrender our position to others who will *not* fail, and their name is "*legion*".

## THE FARMERS' INSTITUTE.

Through the liberality of our last Legislature we have been enabled to hold our Farmers' Institutes in every county of the State, and *two* where the demand was urgent. As you are aware, this department is our most valuable method of doing effective and permanent work, as it is only through its agencies we can bring the farmers together, face to face, and interest them in *each other first*—then in their *common employment*. The interchange of ideas thus effected, the farmer and the professor becoming acquainted and in touch enables us to disseminate agricultural knowledge which would otherwise never be attained by the farmer who is not naturally literary in his inclinations. Without the Farmers' Institute the Board of Agriculture would be to-day but little more than a name, so far as benefiting the farmers is concerned. We may continue to meet here twice a year for time immemorial and pass resolutions recommending this and that, but what effect will this have on our farmers if we do not put our resolutions into effect. Theory is incomplete without practice. The object lesson is useless unless you demonstrate by actual facts the *meaning* of it. The Board of Agriculture is the cause, ths Farmers' Institute the effect, and we are very proud of the *effect*.

I wish to say in this connection that I believe our Farmers' Institutes will favorably compare with those of any other State in the Union, and this is great praise, as some of them are of much greater age than ours. Much prominence is given at the present time to this work in the leading agricultural States. I would, therefore, recommend to the Board the continuance of our Institute Director for at least one more year, as we cannot afford to nip this healthy plant in the bud. In a few of the counties of the State the people are a little slow to take hold, and if at the expiration of another year this little deficiency is remedied, then our work will not have been in vain. There is very much more interest manifested now than there was last year. When a few farmers are willing to meet together for mutual improvement it is our duty, and should be our pleasure also, to send some one to instruct them; or in other words, encourage them to instruct *themselves* and give them a judicious start along the up-grade.

## CONTAGIOUS DISEASES AMONG DOMESTIC ANIMALS.

I would further suggest to the Board the advisability of instructing the Secretary to re-print the same rules concerning contagious diseases among our domestic animals. I wrote a short article six months ago instructing the farmers as to whom they should apply when contagious diseases break out among their animals, but for some unknown reason the Secretary omitted the essential part of my article and it was not published. As I knew the farmers needed explicit, printed information on this important subject, I was very much disappointed. I want to say in this connection that we have been very successful in controlling these diseases which so many of our farm animals have fallen heir to. While we have destroyed a few this summer, the general health among our animals all over the State is good. From the reports I receive from other States, we have as little trouble in this line, with less expense, than any of our sister States. The Board has done good work in the past, and it is the duty of each member to "let the good work go on," if we hope to fulfill the mission for which the Board was created.

### VETERINARY SURGEONS.

I would suggest for the sake of economy that the Board appoint one or two more veterinary surgeons in the parts of the State where we do not have one, and we have none in the *southern* part of our State.

In conclusion, I want to thank the different members of the Board for their courteous treatment toward me at all times as your President, and to express the hope that harmony and "peace and good-will to all" will mark the deliberations of this session.

Respectfully submitted,
S. W. ATKINSON, President.

October 1st, 1900.

### SECRETARY'S REPORT.

*Mr. President and gentlemen of the State Board of Agriculture.*

We have met in 20th semi-annual session as representatives of the most important industry in the State. It was the first industry, and is yet the basis of every other. This is not only true of other states, but our own, which is best known to the world for its vast coal area of superior quality, the greatest producer of oil of the best grades, and extensive forests of fine hard wood timber, which has attracted millions of capital in the last few years.

That the interests of our agricultural industry may not suffer, but gain a supremacy it has not yet reached, is the concern of this board, and should stimulate all its deliberations.

Science and art, which have done so much for the mechanical industries, is now being applied to agriculture and has accomplished a great deal, but is destined to do far more in the future. With all the agencies that are being employed to place the honest tiller of the soil upon a higher basis of intelligence and culture, we may expect in the not far distant future a change that will appear almost revolutionary in its character. The work then that lies before you is one that requires intelligent thought and study and plans well formulated and wisely directed, that the exigences of the times may be properly met.

The season since the last meeting has been a busy one. Work that was mapped out has been diligently prosecuted and we trust the results will prove satisfactory.

With few exceptions the season has been a productive one for the farmers, and the prospects are, they will receive something like a just reward for their labors.

An important branch of farming in our State, is the fruit industry, but as the season is not sufficiently advanced, reports from the most important sections have been somewhat meagre, and anything like a correct estimate has not yet been received. So far as we can learn from our correspondents, the farmer's orchards will hardly average one-fourth of a crop. This either results from natural or unavoidable causes, or neglect, and we are inclined to believe, that to a very great extent, it is the result of neglect and proper care of the orchards.

For the comfort, health and happiness of every farm home, a bountiful supply of fruit should be produced, and upon this particular subject, a majority of the farmers know less about than any other. This fact should be kept in mind and a special effort made to instruct the farmers as to the proper care of orchards.

Reports received from our correspondents indicate that there is about an average increase in the number of live stock, and that there is a growing interest in improved breeds. There are very few diseases reported by our regular corps of contributors, and only a few cases have been reported by stock owners. Most of these have been referred to our State Veterinarians, and no doubt will be included in their reports.

## DISEASED STOCK.

Following are the cases reported during the past six months by the Veterinarians where the animals were appraised and destroyed:

May 25, 1900, Alkire Bros., Keyser, one high grade short horn, disease blackleg, appraised at $15.00, and reported by Dr. S. E. Hershey.

August 4, 1900, Benj. F. Holbert, Monongah, one cow, disease tuberculosis, appraised at $20.00, reported by Dr. F. P. Ruhl.

August 30, 1900, Jacob Dougherty, Proctor, two mares, disease, glanders, appraised at $95.00, reported by Dr. Wm. Petrie.

September 20, 1900, Samuel Heizman, New Martinsville, one horse, disease glanders, appraised at $40.00, reported by Dr. Petrie.

These cases are to be considered by you and proper steps taken to re-imburse the owners for the loss they have sustained.

At the last meeting the secretary was requested to issue certificates for stock previously killed, to S. C. Wood, Cowen, $5.00. J. H. McKinly, Lightburn, $12.50. Wm. W. Matthews, Morgantown, $15.00. These certificates have been signed and returned.

## FARM REVIEW.

We again call your attention to our monthly publication, the Farm Review. Before the next regular meeting of the board the present contract for printing will have expired and such provision should be made for its continuance in its present form, or change of form, as you may deem expedient and proper. The idea of publishing a quarterly instead of a monthly has been suggested, but like the monthly publication, it may have its advantages and disadvantages. A quarterly should embody the same general plan as the present publication, but the material should be well selected and of the best. It might be gotten up in such a way that the form could be preserved and at the end of every two years if bound together constitute the bi-ennial report of this department. This plan or a similar one, is followed by the boards of agriculture in other states, and has met with the highest approval.

It might be well to mention here that the material for publication is running down, and this is a matter of deep concern to an editor. It is impossible to make a paper or periodical what it should be, without good, live, practical material.

Our Institute Director reports, that very few papers are any more prepared and read at the institutes, and for this reason, as well as a falling off of those accustomed to sending in voluntary contributions, we are beginning to lack for material. We can not insist upon those who have heretofore been generous enough to contribute voluntary articles, so we have to depend upon a generous public altogether and the supply is very uncertain. Our publication being issued as it is from one of the State departments, should contain the best that is to be had. And here I would like to suggest that you consider the plan of offering premiums of $10.00 or more for first, and a second or third might be added for the best article on given subjects. The range of subjects to include every department or line of farming. If such a plan is pursued it is likely to stimulate the best and most practical talent we have, and stir up the latent energies of those who could never be heard from in any other way. One unique feature about the Farm Review, is, that it is distinctively a state paper, and its leading articles have been contributed by our own people, and this feature more than anything else commends itself to our farmers who take it and read it, and occasionally speak a good word for it.

## STATISTICAL REPORTS.

The matter of accurate and "reliable statistical reports from each county, is another matter it would be well to look after. The difficulty of obtaining these reports for the Fifth Biennial Publication, is sufficient proof, that the present law requiring county officers to furnish all the necessary statistics required by the board is by no means satisfactory. Under existing circumstances the assessors or county clerks, can only furnish the number and assessed value of domestic animals, and these can not be reported until the assessors have completed their year's work ready to turn in to the county clerks.

This work seems to require considerable time as twenty counties have not yet reported. This is sufficient to show that the present law, while intended to assist the Board in obtaining all the necessary data for full and accurate reports, fail in two important particulars.

First: It does not provide the assessors with suitable blanks, to take down the acreage and production of the various crops, together with the number and value of all live stock; and

Second: That said blanks should be forwarded to the office of this Board, immediately after the assessor has completed his work of taking the same. This matter should be brought to the attention of our law makers, to the end that, a full and complete statement of the increase or decrease of our crop and stock production may be accurate and definite and not merely guessed at.

The report was approved.

A statement of the finances for the fiscal year ending October 1, 1900, was read and approved.

## REPORT OF INSTITUTE DIRECTOR.

GENTLEMEN OF THE STATE BOARD OF AGRICULTURE:—This brief report will give you an outline of my work for the twelve months ending October 1st, 1900.

There have been 72 institutes held within this time, with an estimated attendance of 7718, or an average of 107 to each, at a cost of $2,295.34, or an average of $31.87 per meeting. This includes all the expense, such as salary of Institute Director, printing programs and posters, expenses of members attending institutes, etc.

Institutes have been held in 44 counties during the past year. Meetings have been arranged for 10 institutes this October.

The attendance at these institutes, in a great many instances, was not so large as we would desire, but when we remember that the Institute Department is but two years of age and that at least 50 per cent. of the farmers have not heard of the existence of such an institution, we have every encouragement which reasonable men could ask or expect.

Several times I have been asked if the institute is having the desired effect upon the farmers; if I thought the money expended in this behalf was being well spent, etc., etc. My answer invariably is, there is not a single department of State from which the people derive *more benefit*. You may ask me if the political conditions of our present campaign interfere with our work in the institute; I answer that it may hinder us to some extent in some communities; but I have received more calls for institutes to be held in October than it was possible for us to accommodate. This will give you some idea of how the institute is regarded by the farmers.

Gentlemen, if you decide, after mature deliberation, that the Farmers' Institute is not important enough to receive almost your entire attention, it is my opinion that your Board will cease to be effective. How else could the farmers be benefited?

I have observed that the farmers are doing a great deal of reading and thinking along the line of agricultural education at the present time, and the indications are favorable for the final overthrow of real ignorance as regards tilling of the soil, and when we succeed in making the study of farming a pleasure to them then the general effect will be encouraging in the extreme. A great many ideas which prevailed ten years ago are now being laid aside and new ones are taking their place, thus keeping the farmer in the front rank of Twentieth Century development. I cannot remember a single instance where we have held institutes that we did not meet a few farmers who are endeavoring to practice the new theories which they have learned either from the institute or from agricultural papers. These few are the leaven which will finally *leaven the whole lump.* Seeing their success, their neighbors want to "go and do likewise". Such a work as this cannot be treated with indifference by any of our Boards of Agriculture.

Thanking you, one and all, for the able assistance you have rendered me during the year just closed, and wishing you a pleasant, profitable session this report is respectfully submitted.

D. M. SULLIVAN, Institute Director.

October 1st, 1900.

The report was approved.

Reports from Drs. Wm. Petrie and S. E. Hershey, were submitted and after being read, were approved and ordered printed in the Biennial Report.

The value of our song and game birds to the farmer and their proper protection became the subject of discussion, and Prof. T. C. Atkeson was appointed to draft suitable resolutions recommending that the birds that inhabit and frequent the State be properly protected.

Adjourned until next morning.

## TUESDAY, OCTOBER 2.

The Board met pursuant to adjournment at 9 P. M.; President S. W. Atkinson in the chair.

The foregoing reports were taken up and approved and the Secretary was directed to issue certificates for the animals that had been killed, viz:

| | |
|---|---|
| Alkire Bros., one steer, @ | $15.00 |
| Benj. F. Holbert, one cow, @ | 20.00 |
| Jacob Dougherty, two mares, @ | 95.00 |
| Samuel Heizman, one horse, @ | 30.00 |

Dr. F. P. Ruhl, consulting Veterinarian, read his report, which was approved and ordered printed in the Biennial Report.

The committee previously appointed to draft a bill to present to the next legislature that would prevent the importation into the State of diseased animals for breeding purposes, was called for, read and received for further consideration.

On motion, a committee was appointed consisting of Dr. F. P. Ruhl, T. C. Atkeson and James George to revise the report.

Adjourned until 1:30 P. M.

## AFTERNOON SESSION.

Meeting convened at the hour appointed.

The committee appointed to revise the quarantine bill submitted their report, which was adopted, with instructions that it be presented to the next legislature when it meets.

Prof. T. C. Atkeson, as previously appointed, submitted the following resolution:

*Resolved*, That this Board heartily endorses the "Lacy Bird Law," and the effort that the National Department of Agriculture is making to prevent the needless and criminal destruction of our song, game and other birds.

2nd. That this Board deems it within the scope of its duties, to do all it can to prevent the killing of birds in this State, because of their great economic value to our agricultural interests.

3rd. We recommend the enactment of a law by the next legislature that will more effectually protect the song, game and other birds of this State.

The report was unanimously adopted.

On motion, D. M. Sullivan was elected Institute Director for one year to succeed himself.

Prof. T. C. Atkeson submitted a plan and suggestions with a view to improving the future work of the farmer's institutes, which was accepted for future consideration, and ordered to be printed as a part of the proceedings of this meeting. The report reads as follows:

## FARMERS' INSTITUTE—SOME PLANS AND SUGGESTIONS.

For twenty-five years I have given considerable thought to all the problems, plans and schemes, including the Institute, that have been devised for the improvement of our farmers. The "American Agriculturist" says, in a recent editorial:

"The Farmers' Institute has been a remarkably potent factor in improving the condition of country people. It is the one meeting of the year where farmers get together to receive practical instruction and to be benefitted by an exchange of experiences concerned exclusively with the growing of crops, the care of live stock, the development of the home. As only one meeting of this kind each year is possible in most localities, topics not directly relating to farming must not be permitted to appear on the program. The farmer can get his moral and religious instruction from the church, his politics and news from the daily or weekly paper, his literary culture and his knowledge of foreign lands from books and periodicals. The Farmers' Institutes must tell him what kind of corn will do best in his neighborhood and how to grow it; what breed of hogs is wanted by his market and how to most economically produce them; what dairy product it will pay him best to manufacture; what small fruits are most hardy and profitable for him. If the Institute fails to do this, interest will disappear, the attendance fall off and the influence of the meeting will not be for the good of agriculture. We refuse to admit that Institutes have outlived their usefulness. On the contrary we believe that only a good beginning has been made, but we warn State and local associations that unless they maintain strictly agricultural meetings where the interested farmer can learn something, they will lose the support of the agricultural public and the not inconsiderable influence they now wield."

If the object of Farmers' Institutes be to instruct farmers, and some feasible way of accomplishing this object cannot be found, the State should abandon the Institute system as too expensive and not giving the result desired. An intelligent farmer writing from another state, says:

"A few years ago the Institutes were held by men who were posted in their respective lines and who gave genuine instruction in various branches of farm work; telling us in detail how to feed various kinds of stock for various purposes, how to build silos, make butter and raise crops of different kinds, etc. Now, whether the subjects have become exhausted or the conductors and speakers, I do not know, but the fact remains that we have now very little instruction and a vast deal of stuff of little more use to a farmer than a comic almanac. This is the reason that Institutes are not better attended. A farmer cannot afford the time to go and listen to men who seem to think all they need to do is look pleasant and talk, and that the farmer will be pleased with anything he may say."

Institutes are designed to be educational institutions, as much as schools and colleges, and upon this theory alone is their support by the State justified. Another farmer, writing from Michigan, says:

"The great trouble with colleges is they don't reach the multitude. Most people can't go to college. Now, institutes are designed to carry the college out to the people. They stand for general diffusion of expert knowledge; they try to give a lift to people whose school days have gone by forever; they are aimed to be of use and inspiration to the folks who want to learn, but can't get to the center of learning; they are for the people who are busy at work, and who can stop only a moment now and then to catch breath. Is it not the states right, nay, her duty, to appropriate money for this benificent purpose?"

In expending these appropriations, made by the state, I believe it to be the duty of this State Board of Agriculture to give the support of farmers institutes full and careful consideration with a view to devising the best possible ways and means of securing the greatest educational benefit to the farmers of the state along advanced lines of agriculture. In order to do this it is absolutely necessary that all institute conductors should possess special training and equipment for the work. Such instructors must possess such knowledge of the subject they profess to teach as will command respect from the most intelligent farmers. With a view to raising the standard of the institutes in this State, and increasing their efficiency, I submit the following suggestions for your consideration.

1. Under the direction of the State Board of Agriculture, its secretary shall have general charge of the farmer's institute work, in this State, and in consideration of this extra work the secretary shall be given such assistance as may be necessary.

2. At the April meeting of each year the Board, with the assistance of the secretary, shall provide for all institutes to be held between July 1 and January 1, following, by selecting instructors, fixing dates, and naming places; and at the October meeting, the institutes to be held between January 1 and July 1, following, shall be provided for in the same way.

3. The board shall elect, for one year at a time, as many institute instructors as may be necessary, one-half of whom shall be elected at the regular meeting in April, and the other half at

the regular October meeting. Said institute instructors to be paid such amount as may be agreed upon. Institute instructors shall be selected from the available men best equipped to give practical and scientific instruction.

4. Members of the Board of Agriculture, the secretary and his assistants shall be ex-officio institute instructors, and shall receive actual expenses and such other compensation as may be agreed upon, while so employed.

5. Members of the Agricultural Experiment Station Staff and the Faculty of the University College of Agriculture shall be ex-officio institute instructors and the College and Station are urgently invited to send at least one representative to each institute.

6. The President of each County Farmers' Institute Society, whose duty it shall be to preside at all county institute meetings and assist and co-operate with the secretary of the board in advertising, arranging program, securing halls, music, and looking after the local details, shall receive such compensation as the board may determine, and be designated as County Institute Instructor.

7. A list of the dates, places, and all institutes and the names of institute instructors who are assigned to each institute shall be published in pamphlet form and in the Farm Review for at least three months in advance.

8. At least one institute instructor, and not more than two in any case, shall be assigned to each county institute by the Board or its Secretary. Exceptions may be made to this rule in case of the assignment of members of the Station staff and College of Agriculture faculty.

9. Itemized statements of all bills, per diem and expenses, provided for by these rules, shall be submitted to the Board and passed upon before being paid.

10. At the discretion of the Board special institute lecturers, from outside the State, may be employed to attend farmers' institutes upon such conditions as the Board and said lecturers may agree.

11. That the county institute program should be at all times under the control of the institute program committee, and that entertainments foreign to institute lines, consisting of brass bands, comic songs, recitations, school contests and theatricals, etc., be discouraged, except at evening sessions.

12. That at least one session of each institute be conducted by the farmers' sons and daughters, and that the program of this session be made up of topics of special interest to them.

13. That no speakers be placed upon a program without first obtaining their consent to be present and perform the part assigned them.

14. That a system of class instruction, where competent parties can be secured to conduct the same, be introduced for the

benefit of those who may be interested in special subjects and desire more detailed information than can be given in a discussion of the subject.

15. That every person who agrees to take a place upon the program be required to prepare a carefully written paper upon the subject selected.

16. That no institute should be less than one day and a half in duration and wherever practicable a night session of an entertaining character should be provided.

17. That no institute will be held in counties where the farmers do not manifest some desire to have the institute and express some willingness to assist in the local arrangements.

In conclusion I desire to say that the experience of other states is, that the institute work cannot stand still and that the farmers are constantly demanding a higher class of instructors, and that if we hope to justify the expenditure of what the institutes are costing, we must devise some means of making them worth the money. This the Legislature and the tax payers have a right to demand of us, and I trust that in your wisdom you may devise some means of making the farmers' institutes in this State the educational power they were intended to be.

Respectfully submitted.

A bill was presented to the Board for expenses in handling and treating the cattle quarantined in Mason county, and after due consideration, the following resolution was adopted:

*Resolved*, That the Board, after fully considering the bill of Mr. E. L. Neal, for assistance rendered the consulting Veterinarian in making examination and assisting in treating the cattle of Mr. W. J. Keister, are of the opinion, that it is not a proper bill against the Board, and that said bill should be paid by the owner of the cattle.

Adjourned until 10:00 A. M.

## WEDNESDAY MORNING, OCTOBER 3, 1900.

The Board met pursuant to adjournment.

The publishing of the Farm Review was first taken under consideration.

The advisability of changing the form of said publication was fully considered, and on motion the following order was adopted:

ORDERED: That, the style and form of the Farm Review, beginning with the January, 1901, issue, be the same as that of the Farm Journal, and that a contract be made with the lowest responsible bidder for printing 2,000 copies of the January, 1901 issue, 2,500 of the February issue and 3,000 of the March issue. The contract to be on the basis of 16 pages and per page for each additional page that may be required.

On motion, D. M. Sullivan and J. B. Garvin were appointed a committee to submit propositions for bids for printing according to the plan adopted.

On motion, it was decided that when the Board adjourns, it adjourn to meet the first Monday preceding the meetings of the State Horticultural Society and the Sheep Breeders & Wool Growers' Association.

### APPOINTMENTS.

Drs. J. C. Callendar, Parkersburg, and W. M. Stanley, Charles Town, were appointed consulting Veterinarians to the Board.

After duly discussing the matter, a resolution was adopted as follows:

WHEREAS, After full discussion of the subject, the State Board of Agriculture reached the conclusion that it was within its powers to offer prizes for the best written article on special and important agricultural subjects, therefore be it

*Resolved*, That a first prize of $10.00, and a second prize of $5.00 be offered for the two best articles on the subject, "The present fruit industry in West Virginia and its future possibilities."

And two similar prizes for the two best articles on the subject of "The present live stock industry in West Virginia and its future possibilities."

All articles submitted to become the property of the Board and to be of not less than 3,000 or more than 5,000 words in length. All papers to be in the hands of the Secretary by the first of March, 1901. Committee of award to consist of three members to be appointed by the Board of Agriculture.

A committee was appointed consisting of James George and J. B. Garvin to formulate recommendations for the consideration of the next legislature.

The President and J. C. Lewellen were selected a committee to audit the Secretary-Treasurer's account.

Adjourned until 9:30 A. M.

### THURSDAY, OCT. 4, 1900.

Board re-convened at 9:30 A. M.

The committee appointed to audit Secretary-Treasurer's account reported the same to be correct.

The committee appointed to formulate recommendations presented their report which was adopted.

Bids for printing the monthly publication were submitted, and the Donnally Publishing Co., being the lowest, their offer was accepted. It was moved and seconded that the institute director and secretary be appointed a committee to draw up the contract with said Publishing Co., for printing the Review under the new form of 16 pages from January to March 1901, inclusive.

It was moved and carried to have one consulting veterinarian attend each meeting of the board in the following order: Dr. Wm. Petrie at the regular April meeting 1901, Dr. S. E. Hershey, the October meeting 1901, Dr. J. C. Callander the April meeting 1902 and Dr. W. M. Stanley, the October meeting 1902.

Adjourned.

# FINANCIAL STATEMENT.

## DR.

| | | | | |
|---|---|---|---|---|
| 1898. | | | | |
| Oct. | 1 | To Balance due the Board as per 4th Biennial Report | $ | 3,044 76 |
| 1899. | | | | |
| Feb'y | 25 | To Appropriation by the Legislature for two years | | 14,000 00 |
| | | | | $17,044 76 |

## CR.

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|---|---|---|---|
| 1898. | | | |
| Oct. | 3 | By Sec'y and Treas, Institute expense $ | 389 49 |
| | 4 | The Mail Pub. Co., Oct. Review | 114 00 |
| | 4 | Per diem and Expense of members Charleston meeting | 145 67 |
| | 26 | The Mail Pub. Co | 85 00 |
| | 31 | Institute Dir., salary for October | 84 00 |
| | 31 | Secretary's Salary | 84 00 |
| Nov. | 16 | Sec'y and Treas. for Institute expense | 322 70 |
| | 30 | Institute Director's salary for November | 83 00 |
| | 30 | Secretary's salary for November | 83 00 |
| Dec. | 1 | Sec. and Treas. for Institute expenses | 453 55 |
| | 31 | Institute Director's salary for December | 84 00 |
| | 31 | Secretary's salary for December | 84 00 |
| 1899. | | | |
| Jan'y | 31 | Institute Director's salary for January | 83 00 |
| | 31 | Secretary's salary for January | 83 00 |
| Feb'y | 9 | Per diem and expense of members Charleston meeting | 251 50 |
| | 13 | Balance due the Board | 392 05 |
| | 13 | Lapsed back into the Treasury | 222 80 |
| | 28 | Institute Director's salary for February | 83 00 |
| | 28 | Secretary's salary for February | 83 00 |
| March | 8 | Donnally Pub. Co., February Review | 100 00 |
| | 31 | Institute Director's salary for March | 84 00 |
| | 31 | Secretary's salary for March | 84 00 |
| | 31 | Donnally Pub. Co., March Review | 162 50 |
| April | 24 | Donnally Pub. Co , May Review | 118 50 |
| | 24 | Secretary and Treasurer contingent expenses | 300 00 |
| | 29 | Secretary's salary for April | 83 00 |
| | 29 | Institute Director's salary for April | 83 00 |
| May | 15 | Secretary and Treasurer, contingent expenses | 300 00 |
| | 23 | Donnally Pub. Co., June Review | 117 50 |
| | 29 | Institute Director's salary for May | 83 00 |
| | 29 | Secretary's salary for May | 83 00 |
| June | 13 | Secretary and Treasurer, contingent expenses | 300 00 |
| | 24 | Per diem and expense of members, Morgantown meeting | 129 55 |
| | 24 | Donnally Pub. Co., July Review | 120 50 |
| | 24 | C. C. Watts, Atty., for defending suit | 75 00 |
| | 30 | By Secretary and Treasurer, contingent expenses | 300 00 |
| | 30 | Secretary's salary for June | 84 00 |
| | 30 | Institute Dir. salary for June | 84 00 |
| July | 22 | Donnally Pub. Aug. Review | 114 50 |

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|---|---|---|---|
| | 31 | Institute Dir. salary for July | 83 00 |
| | 31 | Secretary's salary for July | 83 00 |
| Aug. | 19 | Donnally Pub. Co., Sept. Review | 118 50 |
| | 31 | Institute Dir. salary for August | 83 00 |
| | 31 | Secretary's salary for August | 83 00 |
| Sept. | 2 | Secretary and Treasurer's contingent expenses | 300 00 |
| | 25 | Donnally Pub. Co., October Review | 116 50 |
| | 30 | Institute Dir. salary for September | 84 00 |
| | 30 | Secretary's salary for September | 84 00 |
| Oct. | 23 | Secretary and Treasurer's contingent expenses | 300 00 |
| | 23 | Per diem and expense of members Charleston meeting | 340 95 |
| | 23 | Secretary's salary from October 1st to 18th | 49 80 |
| | 23 | Institute Director's salary from October 1st to 18th | 49 80 |
| | 23 | Secretary's salary from October 18 to November 1 | 33 20 |
| | 23 | Institute Director's salary from October 18 to November 1. | 33 20 |
| | 23 | Secretary and Treasurer's contingent expense | 300 00 |
| Nov. | 11 | S. W. Atkinson, institute work | 21 50 |
| | 11 | Dr. F. P. Ruhl, institute work | 23 55 |
| | 11 | Institute Director's salary for November | 84 00 |
| | 11 | Secretary's salary for November | 84 00 |
| Dec. | 4 | Secretary and Treasurer's contingent expenses | 500 00 |
| | 4 | Institute Director's salary for December | 83 00 |
| | 4 | Secretary's salary for December | 83 00 |
| 1900 | | | |
| Jany. | 16 | S. W. Atkinson, institute work | 32 50 |
| | 16 | Institute Director, institute work | 28 20 |
| | 16 | James George, institute work | 54 00 |
| | 16 | Institute Director's salary for January | 84 00 |
| | 16 | Secretary's salary for January | 84 00 |
| | 16 | Secretary and Treasurer's contingent expense | 500 00 |
| Feby. | 16 | S. W. Atkinson, institute work | 43 90 |
| | 16 | Institute Director's salary for February | 83 00 |
| | 16 | Secretary's salary for February | 83 00 |
| | 16 | Institute Director, institute work | 51 05 |
| March | 6 | James George, institute work | 61 35 |
| | 6 | Secretary, institute work | 12 15 |
| | 6 | Secretary and Treasurer's contingent expense | 500 00 |
| April | 2 | Institute Director's salary for March | 84 00 |
| | 2 | Secretary's salary for March | 84 00 |
| | 4 | Per diem and expense of members Charleston meeting | 225 40 |
| | 4 | Dr. F. P. Ruhl, V. S | 29 15 |
| | 5 | H. W. Miller, institute work | 22 84 |
| | 18 | James George, institute work | 8 40 |
| | 19 | Secretary, institute work | 9 75 |
| | 19 | Institute Director, institute work | 29 00 |
| | 19 | Institute Director's salary for April | 83 00 |
| | 19 | Secretary's salary for April | 83 00 |
| May | 1 | Secretary and Treasurer's contingent expense | 500 00 |
| | 30 | Institute Director's salary for May | 84 00 |
| | 30 | Secretary's salary for May | 84 00 |
| June | 2 | Institute Director, institute work | 78 00 |
| | 2 | S. W. Atkinson, institute work | 9 00 |
| | 16 | Dr. S. E. Hershey, V. S., institute work | 4 60 |
| | 25 | Institute Director's salary for June | 83 00 |
| | 25 | Secretary's salary for June | 83 00 |
| | 25 | Institute Director, institute work | 31 00 |
| | 25 | Secretary, institute work | 10 50 |
| | 25 | Secretary and Treasurer's expense | 500 00 |
| July | 11 | Dr. F. P. Ruhl, institute work | 2 30 |
| | 31 | Institute Director's salary for July | 83 00 |
| | 31 | Secretary's salary for July | 83 00 |

| | | | | |
|---|---|---|---|---|
| | 31 | Dr. Wm. Petrie, V. S., expense attending committee meeting | 9 20 | |
| Aug. | 8 | Dr. S. E. Hershey, V. S., expense attending committee meeting | 8 50 | |
| | 20 | S. W. Atkinson, institute work | 20 65 | |
| | 25 | Institute Director's salary for August | 83 00 | |
| | 25 | Secretary's salary for August | 83 00 | |
| | 25 | Institute Director, institute work | 49 40 | |
| Sept. | 19 | James George, institute work | 5 50 | |
| | 30 | Institute Director, salary for September | 83 00 | |
| | 30 | Secretary salary for September | 83 00 | |
| | | To amount drawn to date | 13,374 15 | |
| | | Balance due board | 3,670 61 | |
| | | | 17,044 76 | 17,044 76 |

## DISEASED ANIMAL FUND.

| | | | | |
|---|---|---|---|---|
| 1899. | | | | |
| Feb'y | 25 | To deficiency appropriation to pay for stock killed | | $405 00 |
| | 25 | To appropriation for destruction of diseased animals for 1899 and 1900 | | 1,600 00 |
| | | | | 2,005 00 |
| April | 3 | By Dr. Dr. Wm. Petrie, V. S. services | $ 35 00 | |
| | 3 | S. W. Atkinson, Pres | 46 00 | |
| | 4 | Fred. Gardner, one cow | 25 00 | |
| | 4 | G. C. Brohard, one cow | 25 00 | |
| | 4 | J. R. Handlan, one cow | 20 00 | |
| | 4 | A. C. Ruby, three horses | 105 00 | |
| | 4 | A. K. Cruley, one horse | 35 00 | |
| | 4 | J. W. Miller, one heifer | 8 00 | |
| | 4 | Davidson Bros., one bull | 30 00 | |
| | 4 | J. B. Garvin, five cows | 100 00 | |
| May | 9 | S. W. Atkinson, Pres | 31 65 | |
| June | 26 | J. B. Garvin, to pay for service of veterinarian | 10 00 | |
| | 27 | Dr. F. P. Ruhl, V. S | 13 35 | |
| Sept. | 1 | S. W. Atkinson, Pres | 6 00 | |
| Oct. | 23 | S. W. Atkinson, Pres | 5 00 | |
| | 23 | Dr. F. P. Ruhl, V. S | 10 00 | |
| | 23 | Dr. F. P. Ruhl, V. S | 12 00 | |
| Nov. | 2 | Peter Elliott, one horse, pro rata | 18 37 | |
| | 2 | J. F. Butcher, one cow, pro rata | 9 45 | |
| | 2 | A. C. Ruby, eighteen horses " | 551 25 | |
| | 2 | Joseph Bland, two horses " | 53 81 | |
| | 2 | Milford Moore, one horse " | 39 37 | |
| | 2 | Warran Le Hart, one horse " | 15 75 | |
| | 11 | S. W. Atkinson, Pres | 5 00 | |
| | 27 | Dr. F. P. Ruhl, V. S | 40 55 | |
| Dec. | 22 | S. W. Atkinson, Pres | 9 45 | |
| 1900. | | | | |
| Jan'y | 19 | S. W. Atkinson, Pres | 19 25 | |
| April | 4 | Dr. F. P, Ruhl, V. S | 5 50 | |
| | 20 | S. W. Atkinson, Pres | 6 20 | |
| June | 4 | Dr. S. E. Hershey, V. S | 4 00 | |
| | 4 | S. W. Atkinson, Pres | 8 00 | |
| July | 2 | S. W. Atkinson, Pres | 6 50 | |
| | 11 | Dr. F. P. Ruhl, V. S | 15 15 | |
| | 31 | S. W. Atkinson, Pres | 24 50 | |
| | 31 | Dr. Wm. Petrie, V. S | 88 80 | |
| Aug. | 8 | Dr. F. P. Ruhl, V. S | 29 50 | |

| | | | | |
|---|---|---|---|---|
| | 25 | S. W. Atkinson, Pres | 9 55 | |
| Sept. | 1 | Dr. Wm. Petrie, V. S | 33 20 | |
| | 3 | S. W. Atkinson, Pres | 11 60 | |
| | 21 | Dr. Wm. Petrie, V. S | 7 30 | |
| | | Balance due Board | 475 95 | |
| | | | $2,005 00 | $2,005 00 |

## RECEIPTS AND DISBURSEMENTS, SECRETARY-TREASURER'S ACCOUNT.

| 1898 | | | Dr. | Cr. |
|---|---|---|---|---|
| Oct. | 1 | By amount overdrawn in Kanawha National Bank | | 17 00 |
| | 1 | Expressage on stationery | | 50 |
| | 1 | O. A. Petty, P. M. box rent | | 50 |
| | 3 | To Auditors warrant | 389 49 | |
| | 4 | By Donnally Pub. Co., stationery | | 14 85 |
| | 4 | Dr. Ruhl, V. S., institute work | | 20 00 |
| | 5 | O. A. Petty, P, M., stamps | | 4 00 |
| | 8 | D. M. Sullivan, institute work | | 50 00 |
| | 25 | Dr. F. P. Ruhl, V. S | | 13 25 |
| | 25 | Telephone | | 9 00 |
| | 25 | The Mail Pub. Co., bal. on Farm Review | | 23 00 |
| | 25 | Donnally Pub. Co., stationery | | 12 25 |
| | 26 | To space in Farm Review, Experiment Station | 125 00 | |
| | 28 | By O. A. Petty, P. M., wrappers | | 82 50 |
| | 31 | S. W. Atkinson, institute work | | 75 50 |
| | 31 | Dr. F. P. Ruhl, institute work | | 12 35 |
| | 31 | O. A. Petty, P. M., stamps | | 5 00 |
| Nov. | 1 | C. C. Brown, institute work | | 71 00 |
| | 2 | T. C. Atkeson, institute work | | 34 30 |
| | 2 | H. W. Miller, institute | | 48 40 |
| | 12 | Telegram | | 35 |
| | 14 | S. W. Atkinson, institute work | | 30 00 |
| | 16 | To Auditor warrant | 322 70 | |
| | 21 | Advertising | 1 00 | |
| | 25 | By Revenue stamps | | 1 00 |
| | 25 | S. W. Atkinson, institute work | | 20 00 |
| | 25 | R. M. Polk & Co., directory | | 3 00 |
| | 25 | O. A. Petty, P. M., wrappers | | 82 50 |
| | 28 | Mrs. S. S. Brown, stenographer | | 5 00 |
| | 28 | Dr. F. P. Ruhl, V. S., institute work | | 50 00 |
| Dec. | 1 | To Auditors warrant | 453 55 | |
| | 1 | By Donnally Pub. Co., programs and stationery | | 25 50 |
| | 1 | W. M. O. Dawson, typewriter | | 100 00 |
| | 1 | O. A. Petty, P. M., stamps | | 5 00 |
| | 8 | S. W. Atkinson, institute work | | 83 55 |
| | 14 | T. C. Atkeson, institute work | | 21 50 |
| | 17 | J. M. Sydenstricker, institute work | | 12 50 |
| | 20 | D. M. Sullivan, institute work | | 25 00 |
| | 21 | To am't. overdrawn by D. M. Sullivan, for institute work | 10 00 | |
| | 24 | Advertising | 7 50 | |
| | 24 | By Donnally Pub. Co., printing and stationery | | 118 70 |
| | 24 | T. C. Atkeson, institute work | | 83 20 |
| 1899. | | | | |
| Jan. | 3 | By O. A. Petty, P. M., box rent | | 50 |
| | 6 | W. S. Perry, shelves | | 6 50 |
| | 7 | O. A. Petty, P. M., stamps | | 5 00 |
| | 7 | W. S. Perry, repairing desk | | 3 50 |
| | 16 | Telephone | | 9 00 |

| | | | | |
|---|---|---|---|---|
| | 21 | O. A. Petty, P. M., stamps | | 4 00 |
| | 24 | Donnally Pub. Co., stationery and printing | | 33 80 |
| | 26 | O. A. Petty, P. M, stamps | | 4 00 |
| | 31 | S. W. Atkinson, institute work | | 25 00 |
| | 31 | Revenue stamps | | 1 00 |
| Feb. | 8 | Donnally Pub. Co., Printing and Stationery | | 27 00 |
| | 13 | Revenue stamps | | 50 |
| | 15 | To Auditor's warrant | 392 05 | |
| | 15 | By room rent for meetings | | 7 00 |
| | 15 | O. A. Petty, P. M., stamps and wrappers | | 8 00 |
| | 20 | Expressage | | 76 |
| | 20 | O. A. Petty, P. M., stamps | | 15 00 |
| | 22 | Expressage | | 1 80 |
| | 23 | O. A. Petty, P. M., wrappers | | 82 50 |
| | 28 | Donnally Pub. Co., printing and stationery | | 38 90 |
| March | 1 | Daily Gazette | | 40 |
| | 3 | Expressage | | 75 |
| | 4 | O. A. Petty, P. M, stamps | | 8 00 |
| | 8 | O. A. Petty, P. M., stamps and wrappers | | 18 00 |
| | 11 | S. W. Atkinson, institute work | | 76 60 |
| | 16 | Telegram | | 76 |
| | 16 | Donnally Pub. Co., Bal. on Review and mailing list | | 97 80 |
| | 16 | C. K. Leè, repairing desk | | 1 55 |
| | 17 | O. A. Petty, P. M., stamps | | 33 00 |
| | 18 | C. C. Brown, institute work | | 70 00 |
| | 21 | Expressage | | 35 |
| | 28 | To space in Review, West Va. University | 125 00 | |
| | 28 | Advertising. | 3 55 | |
| | 30 | Advertising | 61 | |
| | 29 | By T. C. Atkeson, institute work | | 34 10 |
| | 31 | Expressage | | 50 |
| April | 1 | Donnally Pub. Co., stationery | | 24 00 |
| | 1 | O. A. Petty, P. M., box rent | | 50 |
| | 1 | S. W. Atkinson, institute work | | 26 35 |
| | 3 | To subscriptions | 1 30 | |
| | 5 | By telephone | | 9 15 |
| | 9 | Telegram | | 26 |
| | 11 | By C. C. Brown, Institute work | | 25 00 |
| | 11 | S. W. Atkinson, mileage book | | 30 00 |
| | 11 | Revenue stamps | | 1 00 |
| | 11 | To Subscriptions | 35 | |
| | 19 | By T. C. Atkeson, Institute work | | 12 50 |
| | 20 | O. A. Petty, P. M., stamps and wrappers | | 8 00 |
| | 24 | Donnally Pub. Co., printing, stationery | | 22 20 |
| | 24 | To Auditor's warrant | 300 00 | |
| | 26 | By Dr. Wm. Petrie, expenses | | 9 00 |
| | 28 | O. A. Petty, P. M., stamps | | 10 00 |
| May | 1 | To Subscriptions | 80 | |
| | 1 | By O. A. Petty, P. M., postage April Review | | 75 00 |
| | 2 | To Subscriptions | 1 00 | |
| | 3 | By H. W. Miller, Institute work | | 92 40 |
| | 4 | To Subscriptions | 25 | |
| | 5 | By O. A. Petty, P. M., wrappers | | 82 50 |
| | 9 | Expressage | | 60 |
| | 13 | C. C. Brown, mileage book | | 10 00 |
| | 15 | C. C. Brown, Institute work | | 75 00 |
| | 13 | To C. C. Brown, rebate on mileage book | 10 00 | |
| | 13 | Stamps for Biennial Report | 50 | |
| | 15 | Auditor's Warrant | 300 00 | |
| | 16 | By Expressage | | 30 |
| | 18 | C. C. Brown, Institute work | | 50 00 |
| | 20 | O. A. Petty, P. M., stamps | | 10 00 |

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|---|---|---|---|---|
| | 21 | To Subscription | 80 | |
| | 25 | Subscription | 1 00 | |
| | 25 | By J. A. Roadamon, map | | 3 00 |
| | 26 | O. A. Petty, P. M., wrappers | | 88 00 |
| | 26 | To Subscriptions | 1 30 | |
| | 29 | Advertising | 5 00 | |
| | 30 | Advertising | 1 55 | |
| | 30 | By S. W. Atkinson, Institute work | | 5 65 |
| | 30 | D. M. Sullivan, Institute work | | 75 00 |
| June | 10 | J. M. Sydenstricker, Institute work | | 39 70 |
| | 10 | Donnally Pub. Co., stationery | | 20 05 |
| | 13 | Expressage | | 30 |
| | 13 | To Auditor's Warrant | 300 00 | |
| | 16 | By D. M. Sullivan, exp. attending meeting of Board | | 31 60 |
| | 16 | J. Q. Rathburn, exp. attending meeting of Board | | 80 90 |
| | 24 | To Subscription | 10 | |
| | 26 | By S. W. Atkinson, exp. attending Legislature | | 48 00 |
| | 30 | N. R. Harmon, lettering | | 2 00 |
| | 30 | To Auditor's warrant | 300 00 | |
| July | 1 | By O. A. Petty, P. M., box rent | | 50 |
| | 1 | O. A. Petty, P. M., wrapers | | 88 00 |
| | 2 | To advertising | 10 00 | |
| | 5 | To advertising | 15 00 | |
| | 6 | By O. A. Petty, P. M., stamps | | 5 00 |
| | 8 | To advertising | 3 00 | |
| | 10 | By telephone | | 9 00 |
| | 15 | Expressage | | 25 |
| | 20 | O. A. Petty, P. M., postal cards and stamps | | 15 00 |
| | 22 | Donnally Pub. Co, stationery etc | | 27 80 |
| | 24 | To subscription | 25 | |
| | 29 | By O. A. Petty, P. M., wrappers | | 88 00 |
| | 31 | Mrs. S. S. Brown, stenographer | | 10 00 |
| Aug. | 1 | C. C. Brown, institute work | | 10 00 |
| | 2 | O. A. Petty, P. M., wrappers and stamps | | 10 00 |
| | 2 | Geo. F. Lasher, Postal Guide | | 2 50 |
| | 7 | D. M. Sullivan, institute work | | 25 00 |
| | 7 | To subscription | 30 | |
| | 8 | D. M. Sullivan, overdrawn for institute expense | 6 50 | |
| | 12 | Advertising | 6 00 | |
| | 18 | By C. C. Brown, institute work | | 26 00 |
| | 19 | Donnally Pub. Co., stationery | | 13 80 |
| | 28 | N. R. Harmon, lettering | | 2 00 |
| | 28 | O. A. Petty, P, M., wrappers | | 88 00 |
| | 30 | C. C. Brown, institute work | | 15 00 |
| | 31 | Mrs. S. S. Brown, stenographer | | 10 00 |
| Sept. | 2 | To Auditor's warrant | 300 00 | |
| | 5 | Advertising | 15 00 | |
| | 5 | By S. S. Moore, book rack | | 3 00 |
| | 6 | O. A. Petty, P. M., stamps | | 10 00 |
| | 9 | Donnally Pub. Co., stationery and printing | | 15 30 |
| | 11 | C. C. Brown, institute work | | 50 00 |
| | 16 | O. A. Petty, P. M., wrappers | | 88 00 |
| | 16 | Jas. George, institute work | | 8 20 |
| | 18 | To advertising | 13 00 | |
| | 21 | By O. A. Petty, P. M, stamps and wrappers | | 10 00 |
| | 25 | To advertising | 15 00 | |
| | 25 | C. C. Brown, overdrawn for institute expense | 15 00 | |
| | 30 | By Mrs. S. S. Brown, stenographer | | 10 00 |
| Oct. | 2 | C. C, Brown, mileage book and institute expense | | 75 00 |
| | 2 | O. A. Petty, P. M., box rent | | 50 |
| | 2 | Donnally Pub. Co, printing and stationery | | 17 95 |
| | 2 | D. M. Sullivian, institute work | | 60 00 |

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|---|---|---|---|---|
| | 12 | To D. M. Sullivan, overdrawn for inst. exp. | 15 00 | |
| | 14 | By S. W. Atkinson, exp. attending meeting of board | | 10 00 |
| | 16 | D. M. Sullivan, exp. attending meeting of Board | | 20 92 |
| | 23 | To Auditor's warrant | 300 00 | |
| | 23 | C. C. Brown, rebate on milage book | 8 30 | |
| | 30 | By J. B. Garvin, exp. attending meeting of board Lewisburg | | 10 10 |
| | 30 | O. A. Petty, P. M., stamps | | 8 00 |
| | 31 | O. A. Petty. P. M,, wrappers | | 88 00 |
| | 31 | Mrs. S. S. Brown, stenographer | | 10 00 |
| Nov. | 1 | Telephone | | 9 00 |
| | 1 | Donnally Pub. Co., program's and stationery | | 30 71 |
| | 1 | D. M. Sullivan, dir. mileage Book | | 60 00 |
| | 2 | To Auditor's warrant | 300 00 | |
| | 6 | By Donnally Pub. Co.,, Nov., Review | | 70 00 |
| | 9 | O. A. Petty, P. M., postage and wrappers | | 5 50 |
| | 15 | Donnally Pub. Co., balance on Nov. Review | | 35 75 |
| | 20 | To Advertising | 6 00 | |
| | 23 | By S. W. Atkinson, institute exp. and milage book | | 70 00 |
| | 24 | O. A. Petty, P. M., wrappers and postage | | 93 50 |
| | 24 | Donnally Pub. Co., expressage on stationery | | 2 35 |
| Dec. | 1 | Donnally Pub Co., stationery | | 24 70 |
| | 4 | To Auditor warrant | 500 00 | |
| | 4 | By Donnally Pub. Co., Dec. Review | | 106 00 |
| | 5 | To Donnally Pub. Co., for list of names | 5 00 | |
| | 21 | By D. M. Sullivan, institute work | | 31 05 |
| | 22 | O. A. Petty, P. M., stamps | | 6 00 |
| | 23 | Donnally Pub. Co., stationery | | 25 30 |
| | 27 | Dr. F. P. Ruhl, institute expense | | 25 40 |
| 1900. | | | | |
| Jan'y | 1 | To subscriptions | 1 30 | |
| | 1 | By O. A. Petty, P. M., stamps | | 1 30 |
| | 3 | Donnally Pub. Co., January Review | | 100 00 |
| | 9 | Telephone | | 9 00 |
| | 10 | O. A. Petty, P. M., wrappers and postage | | 93 50 |
| | 12 | O. A. Petty, P. M., stamps | | 5 00 |
| | 15 | Donnally Pub. Co., programs, etc | | 46 75 |
| | 19 | To subscriptions | 1 00 | |
| | 19 | By Donnally Pub. Co., bal. on Jany. Review | | 20 25 |
| | 20 | O. A. Petty, P. M., stamps | | 7 00 |
| | 26 | To advertising | 15 00 | |
| | 29 | By D. M. Sullivan, milage tickets | | 50 00 |
| | 30 | To subscription | 25 | |
| Feb'y. | 3 | By Dounally Pub. Co., Review | | 100 00 |
| | 3 | O. A. Petty, P. M., wrappers | | 88 00 |
| | 5 | Expressage | | 35 |
| | 8 | To Advertising | 2 00 | |
| | 14 | Subscription | 50 | |
| | 14 | By O. A. Petty, P. M., stamps | | 2 50 |
| | 13 | Donnally Pub. Co., printing and stationery | | 33 30 |
| | 17 | Donnally Pub. Co , March Review | | 100 00 |
| | 20 | O. A. Petty, P. M., wrappers | | 88 00 |
| | 29 | To Auditor's warrant | 500 00 | |
| March | 7 | Advertising | 15 00 | |
| | 7 | By Donnally Pub. Co., programs, stationery | | 56 20 |
| | 9 | O. A. Petty, P. M., stamps | | 6 00 |
| | 12 | D. M. Sullivan, institute work | | 5 95 |
| | 12 | J. B. Garvin, institute work | | 3 65 |
| | 14 | O. A. Petty, P. M., stamps | | 75 |
| | 15 | To Subscriptions | 75 | |
| | 15 | Auditor's warrant | 500 00 | |
| | 20 | Subscription | 37 | |

| | | | | |
|---|---|---|---|---|
| | 21 | Advertising | 3 00 | |
| | 21 | By Stamps | | 37 |
| | 27 | Donnally Pub. Co., printing and stationery | | 27 75 |
| April | 3 | Donnally Pub. Co., April Review | | 129 15 |
| | 4 | O. A. Petty, P. M., wrappers | | 90 00 |
| | 5 | O. A. Petty, P. M., stamps | | 7 00 |
| | 6 | Telephone | | 9 00 |
| | 9 | O. A. Petty, P. M., wrappers | | 5 50 |
| | 21 | O. A. Petty, P. M., wrappers | | 93 50 |
| | 23 | Donnally Pub. Co., stationery and printing | | 27 80 |
| | 24 | Encyclopediac Dictionary | | 6 00 |
| | 26 | S. W. Atkinson, institute work | | 50 00 |
| | 28 | O. A. Petty, P. M., stamps | | 6 00 |
| May | 1 | To Auditor's warrant | 500 00 | |
| | 1 | Subscriptions | 1 95 | |
| | 2 | By O. A. Petty, P. M., box rent and stamps | | 3 00 |
| | 2 | Tribune Co., printing and stationery | | 14 50 |
| | 3 | Donnally Pub. Co., May Review | | 122 50 |
| | 19 | W. B. Donnally & Co., expressage | | 90 |
| | 25 | To Advertising | 10 00 | |
| | 26 | By O. A. Petty, P. M., wrappers | | 93 50 |
| | 26 | Stamps | | 1 95 |
| June | 1 | To Subscriptions | 1 00 | |
| June | 1 | Advertising | 24 50 | |
| | 1 | Subscriptions | 3 79 | |
| | 1 | By Donnally Pub. Co., June Review | | 117 50 |
| | 1 | Donnally Pub. Co., printing and stationery | | 16 55 |
| | 1 | Tribune Co., stationery | | 4 50 |
| | 1 | Stamps | | 2 39 |
| | 1 | R. L. Peck & Co., State Directory | | 5 00 |
| | 2 | O. A. Petty, P. M., stamps | | 6 00 |
| | 8 | D. M. Sullivan, institute work | | 25 00 |
| | 18 | D. M. Sullivan, institute work | | 10 00 |
| | 22 | D. M. Sullivan, institute work | | 10 50 |
| | 23 | O. A. Petty, P. M., stamps | | 12 00 |
| | 25 | O. A. Petty, P. M., wrappers | | 93 50 |
| July | 2 | Donnally Pub. Co., July Review | | 117 50 |
| | 2 | Donnally Pub. Co., stationery and printing | | 15 20 |
| | 2 | Tribune Co., stationery and printing | | 5 25 |
| | 5 | O. A. Petty, P. M., box rent | | 50 |
| | 9 | Telephone | | 9 00 |
| | 30 | To Auditor's warrant | 500 00 | |
| Aug. | 1 | By Tribune Co., programs | | 13 00 |
| | 1 | Expressage | | 50 |
| | 6 | O. A. Petty, P. M., P. O. Order | | 3 55 |
| | 6 | O. A. Petty, P. M., wrappers | | 97 50 |
| | 14 | Donnally Pub. Co., August Review | | 99 50 |
| | 14 | Donnally Pub. Co., stationery, etc | | 14 80 |
| | 24 | O. A. Petty, P. M., stamps | | 6 00 |
| | 28 | O. A. Petty, P. M., September Review | | 93 50 |
| Sept. | 1 | Tribune Co., stationery and printing | | 18 25 |
| | 1 | Donnally Pub. Co., September Review | | 118 50 |
| | 1 | Donnally Pub. Co., stationery | | 5 00 |
| | 2 | To advertising | 37 50 | |
| | 12 | By D. M. Sullivan, institute work | | 40 00 |
| | 12 | Butler Printing Co., Programs, etc | | 10 25 |
| | 17 | O. A. Petty, P. M., stamps | | 4 00 |
| | 19 | Adams Express Co., for cut | | 50 |
| | 20 | O. A. Petty, P. M., stamps | | 3 00 |
| | 24 | D. M. Sullivan, institute work | | 8 20 |
| | | To balance deposited in Kanawha National Bank | | 38 49 |
| | | | $3,237 21 | $3,237 21 |

# REPORT

OF

# INSTITUTE DIRECTOR

FOR

## Two Years Ending Oct. 1, 1900.

# REPORT OF INSTITUTE DIRECTOR.

CHARLESTON, WEST. VIRGINIA,
October 1st, 1900.

*To the President and Members of the State Board of Agriculture:*

I herewith transmit a report of the Institute work for the past two years beginning October 1st, 1898, with such other papers as are deemed of importance. Believing that a proper appreciation of Farmers' Institutes and the benefits to be derived from the same, will encourage their continuation, while neglect will drive the farmers from the fields to the congested cities, that our dependence upon agriculture renders a thorough knowledge of the science of agriculture of the highest necessity, this Department has employed its best efforts in the dissemination of such information as would aid and dignify the calling and stimulate interest, all along the line. Trusting that what we have accomplished will meet your commendation and be appreciated by the public, I have the honor to remain,

Respectfully yours,
D. M. SULLIVAN,
Institute Director.

# THE OBJECT OF FARMERS' INSTITUTES.

I will endeavor just as briefly as I can to define the object of the institute work and tell you what we hope to accomplish by organized effort in this direction, and acquaint you with the results we are already realizing from the work. If we benefit the farmer, we must go to him, and about the only way to approach him is in the institute work. The object in the first place, is to stimulate a proper self-respect for the occupation, getting rid of the idea so long prevalent that the agriculturist has no field for thought or mental culture. The institute improves the social condition of our farmers, which oft times is greatly neglected, for the farmer who makes a perpetual drudge of himself blunts and stupefies his intellect, dwarfs his mental yearnings and leaves himself a slave to ignorance and incredulity. Social contact with others will teach him the things it is to his advantage to believe more successfully than books and papers. It is a place where our farmers have an opportunity of meeting men who are in advance in the science of agriculture. The teaching of the Institute is essentially a missionary work, the heralding of the gospel of a new dispensation of better things to come to agriculture. It is the challenge of the sentinel on duty to his sleeping comrades to awaken and bestir themselves and prepare for the march and the conflict. It is a call to the sluggard to mend his ways. In travelling over our State I am sorry to say that I see too many places that do not look as they might be made to look with just a little energy. Why not make the surroundings of the home cheerful and pleasant, and everybody happy? The Institute affords the farmers generally a convenient and inexpensive opportunity to personally meet men noted in their line of business, men of whom they have read and known. They are, or have been, practical farmers, diligent students of the fundamental principles of agricultural science; a correct comprehension of which is essential to economic agricultural products. It is sometimes a difficult problem so to explain and illustrate some of the principles as to be understood by the plain farmers in order to give them some conception which will awaken an interest and lead them to further inquiry and investigation and thereby insure judicious practice. Many a shrewd, practical farmer has been able to take a long step forward in his business because some embarrassing difficulty has been cleared up, or some, to him, knotty problem has been solved through correct, scientific information, obtained in answer to questions propounded at the Institute. A class of speakers which does most excellent work at our Institutes, consists of plain, practical farmers of the vicinity; of stock-breeders, dairymen, poultrymen, fruit growers, etc., in active business life. The class of local speakers to which I refer, is not generally learned men. They know practically what succeeds best, but some of them would trip and stumble badly if they attempted to give the philosophical reason. They have, however, in their several and varied experiences, encountered practical difficulties and problems common to many or to all who are working on parallel lines; and in their own ways and for their own localities, have perhaps often overcome them and solved them. Their words are entitled to receive weight and consideration, as they contain suggestions of great practical value.

Most farmers are imitators. It is so much easier to observe what our neighbor in like circumstances has done, and then imitate him in his successful operations, than pursue for ourselves lines of original experimentation. We grasp an idea all the more readily when it is set before our eyes in the form of an object lesson. It is good for any locality to have an energetic and progressive farmer that he may be an object lesson to the less progressive. I cannot overlook the valuable contributions to the Institute work done by our lady friends. Some of the best papers read before these meetings were prepared by ladies, and in nearly all instances they make the best secretaries. The advancement and adornment of the home, which only a woman's hands can accomplish; the keeping of the house from garret to cellar; the methods of cooking, etc; the social life in the country; the training and education of the children upon the farms; all these, and more, are appropriate themes for treatment by our lady friends. These gatherings of the tillers of the toil are not so well attended as they should be, when we consider their infrequency and that they are the only high schools where the principles of economy on the farm, and progressive farming are taught, and which the every-day, practical farmer has an opportunity to attend. The advantages to be gained by interchange of thought with the brightest minds in our own calling, not only in our own State, but as it sometimes happens, from other States also. Let us protect our Institutes and all other agricultural gatherings, for the good work they are accomplishing, and seek by every means at our command to advance still farther the measure of their fulness. The farmers are the food-producers of the country. Their interest and welfare are matters of common concern, and common solicitude.

The fostering care of the State in contributing to the development of a higher type and larger scale of agricultural production, is not an act of charity, but of patriotism and statesmanship. I venture the assertion that no money appropriated by the State for any educational purpose or otherwise, is producing so large a return in substantial value, dollar for dollar, as the money appropriated for agricultural meetings. To increase the appropriation would mean to increase the value of our State, for whatsoever advances agriculture increases prosperity. There is no more promising field for the exercise of a liberal and judicious fostering care on the part of the State. Finally, allow me to urge upon the members of the State Board of Agriculture to lend all their assistance to this, the most important Department of the State and so keep our ambitious little State in the front rank of the great agricultural procession which is making such gigantic strides toward progression at the present time.

## WHAT WE HAVE ACCOMPLISHED.

I will now state briefly what has been accomplished in the Institute work, proper, from October 1st, 1898, to October 1st, 1900.

We have from one to three county organizations in each of the fifty-five counties of the State. We are using every effort to induce the county officers to hold District Institutes in all of the Magisterial Districts in each county, and we are succeeding handsomely in quite a number of instances. We have held in this time 133 county institutes besides a number of District meetings which are not included in this report. It has cost our Board $5,858.78 or an average of $44.05 to the single institute. The estimated average attendance at these meetings is 155. When we take into consideration the fact that this Department is comparatively in its infancy, and about three-fourths of these institutes were pioneer work, I think we have encouragement to stimulate us to greater effort in the future. All these institutes were organized and conducted under the following Constitution and By-Laws:

## CONSTITUTION FOR FARMERS' INSTITUTE SOCIETIES.

### ARTICLE I—NAME.

This association shall be known by the ...................... County Farmers' Institute Society.

### ARTICLE II—OFFICERS.

Sec. 1. The officers of this Society shall consist of a President, one Vice President from each magisterial district in the county, a Secretary and Treasurer. The President, the first named Vice President, and the Secretary shall constitute the Executive Committee.

Sec. 2. After the organization of the Society, the annual election of officers shall be held during the annual Institute meeting.

Sec. 3. It shall be the duty of the President to preside at all meetings of the Society, to enforce the constitution, and preform such other duties as his office may require. In the absence of the President a Vice President shall perform the duties of that office.

Sec. 4. The Secretary shall keep in a substantial book, or books, a record of all Institute meetings of the Society, and meetings of the Executive Committee. As soon as the organization is completed, he shall report it to the Institute Director of the State Board of Agriculture, with the name of the Society, and the name and the postoffice address of each officer.

Sec. 5. The executive committee, with such sub-committees as it may appoint, shall in due time, complete the arrangements for the annual Institute, and such other Institutes as it may deem advisable by engaging hall, arranging for music and preparing the program which shall occupy fully the time assigned for the Institute meeting. They shall thoroughly advertise and use diligence and enterprise to create an interest among the people and secure the largest possible attendance.

### ARTICLE III—MEMBERS.

Sec. 1. Any farmer residing in the county and attending such meeting shall be considered a member.

Sec. 2. No fees or dues are demanded, but all members are left free to make such voluntary contributions for the support of the Society as they may feel inclined.

### ARTICLE IV—INSTITUTES.

Sec. 1. This Institute Society is organized under the auspices of the State Board of Agriculture, and shall be strictly non-partisan and non-sectarian in every phase of its work, and no speaker shall be allowed to advertise wares or schemes in which he may have a pecuniary interest.

Sec. 2. No fees shall be charged for admission to the Institutes. They shall be public, and free for all, the object being to impart agricultural knowledge and experience free to all persons sufficiently interested to attend.

Sec. 3. Within ten days after the close of each Institute, the secretary shall send a written report to the Institute Director of the State Board of Agriculture, stating the cost of the Institute, members in attendance, speakers absent, speakers who filled appointments, and any new features or matters of special interest.

Sec. 4. Societies, or their executive committees, may, at the call of the President, hold such business meeting other than the Institutes, as may be necessary to transact the business of the Society and arrange for the Institutes.

Sec. 5. The dates of all annual Institutes shall be fixed by the Institute Director of the State Board of Agriculture after consultation with the executive committee, and the constitution adopted by the Board of Agriculture, shall govern all Institutes organized or held under its auspices.

Sec. 6. Such lectures and papers delivered at the Institutes, as may be of general interest and importance to the farmers, stock-breeders and horticulturists of the State, shall be furnished by the Secretary of the Society, to the Institute Director of the State Board of Agriculture, for publication in the Farm Review.

### ARTICLE V—AMENDMENTS.

This constitution may be amended at any regular meeting of the State Board of Agriculture, by a majority vote of its members."

## CONDENSED REPORT OF INSTITUTES.

No. 1. The fourth annual meeting of the Greenbrier County Farmers' Institute Society was held at Falling Springs, October 5th and 6th, 1898. The Board of Agriculture was represented by Messrs. Sydenstricker, Miller, Ruhl and Brown. The Institute was re-organized by the election of the following officers:

A. M. McLaughlin, President, Lewisburg.
M. A. Jackson, Vice-President, Lewisburg.
C. E. Lewis, Secretary and Tueasurer, Savannah.
The estimated attendance was 60.

No. 2. The third annual meeting of the Pocahontas County Farmers' Institute Society was held at Academy, October 7th and 8th, 1898. The board was represented by Messrs. Sydenstricker, Miller, Ruhl and Brown. The Society was re-organized by the election of the following officers:

G. R. Curry, President, Academy.
E. N. Moore, Vice-President, Dunmore.
T. A. Sydenstricker, Secretary and Treasurer, Academy.
The estimated attendance was 200.

No. 3. The first annual meeting of the Farmers' Institute Society of Webster County was held at Cowen, October 11th and 12th, 1898. The board was represented by D. M. Sullivan. The Society was organized by the election of the following officers:

E. L. Morton, President, Strouds.
Solomon Starcher, Vice-President, Bolair.
W. E. Gardner, Secretary and Treasurer, Cowen.
The estimated attendance was 80.

No. 4. The first annual meeting of the Braxton County Farmers' Institute Society was held at Sutton, October 13th and 14th, 1898. The board was represented by Secretary D. M. Sullivan. The society was re-organized by the election of the following officers:

Henry Bender, President, Chapel.
P. W. Hardman, Vice-President, Falls Mills.

T. H. Hawkins, Secretary and Treasurer, Sutton.
The estimated attendance was 30.

No. 5. The first annual meeting of the Calhoun County Farmers' Institute Society was held at Grantsville on October 17th and 18th, 1898. The board was represented by S. W. Atkinson and D. M. Sullivan. The society was re-organized by the election of the following officers:

S. C. Barr, President, Grantsville.
L. M. Ruffner, Secretary and Treasurer, Grantsville.
Emery Ball, Vice-President, Grantsville.
The estimated attendance was 35.

No. 6. The first annual meeting of the Gilmer County Farmers' Institute Society was held at Glenville on October 20, 21st, 1898. The board was represented by President Atkinson and Secretary D. M. Sullivan. The society was re-organized by the election of the following officers:

C. B Bush. President, Cox's Mills.
C. Mollohan, Vice-President, Normantown.
T. Marcellus Marshall, Secretary and Treasurer, Stout's Mills.
The estimated attendance was 50.

No. 7. The first annual meeting of the Lewis County Farmers' Institute Society was held at Weston on October 24th and 25th, 1898. The board was represented by Atkinson, Atkeson and Brown—the Experiment Station by Horace Atwood. The society was re-organized by the election of the following officers:

J. E. Norris, President, Freemansburg.
Capt. W. J. Nichols, Vice-President, Gaston.
Perry G. Alford, Secretary, Weston.
The estimated attendance was 200.

No. 8. The first annual meeting of the Harrison County Farmers' Institute Society was held at Bridgeport on October 26, 27, 1898. The board was represented by Messrs Atkinson, Atkeson and Brown. The Experiment Station by Prof. Horace Atwood. The society was organized by the election of the following officers:

William Lewis, President, Bridgeport.
H. R. McCord, Vice-President, Bridgeport.
John Patton, Secretary and Treasurer, Craigmore.
The estimated attendance was 225.

No. 9. The second annual meeting of the Jackson County Farmers' Institute Society was held at Ripley on October 28-29, 1898. The board was represented by Dr. F. P. Ruhl and C. C. Brown. The society was re-organized by the election of the

following officers:
Eli Simmons, President, Grass Lick.
G. S. M. King, Vice-President, Jackson.
B. F. Rader, Secretary and Treasurer, Jackson.
The estimated attendance was 100.

No. 10. The second annual meeting of the Ritchie County Farmers' Institute Society was held at Pennsboro November 17-18, 1898. The board was represented by President S. W. Atkinson, and the Station by Dr. A. D. Hopkins and Prof. B. H. Hite. The society was re-organized by the election of the following officers:
Col. J. M. McKinney, President, Hebron.
B. Beall, Vice-President, Goose Creek.
D. A. Fawcett, Secretary and Treasurer, Pennsboro.
The estimated attendance was 225.

No. 11. The second annual meeting of the Doddridge County Farmers' Institute Society was held at West Union on November 21-22, 1898. The board was represented by its President S. W. Atkinson. The society was re-organized by the election of the following officers:
E. G. Taylor. President, Morgansville.
A. K. Clark, Vice-President, West Union.
A. J. Carter, Secretary and Treasurer, Knight.
The estimated attendance was 100.

No. 12. The first annual meeting of the Barbour County Farmers' Institute Society was held at Philippi November 23-24, 1898. The board was represented by its President Hon. S. W. Atkinson. The society was re-organized by the election of the following officers:
W. D. Zinn, President, Mansfield.
W. S. Lang, Vice-President, Meadowville.
James Oneal, Secretary, Elk City.
E. R. Dyer, Treasurer, Mansfield.
The estimated attendance was 100.

No. 13. The first annual meeting of the Randolph County Farmers' Institute Society was held at Beverly November 25-26, 1898. The board was represented by President S. W. Atkinson. The society was re-organized by the election of the following officers:
R. M. Harper, President, Beverly.
N. Carper, Vice-President, Beverly.
F. M. A. Lawson, Secretary, Beverly.
The estimated attendance was 50.

No. 14. The first annual meeting of the Tucker County Farm-

ers' Institute Society was held at Parsons, November 28-29, 1898. The board was represented by S. W. Atkinson. The society was re-organized by the election of the following officers:
W. W. Hansford, President, Parsons.
B. F. Bennett, Vice-President, Flanagan Hill.
John A. Swisher, Secretary and Treasurer, Parsons.
The estimated attendance was 60.

No. 15. The first annual meeting of the Preston County Farmers' Institute Society was held at Terra Alta, November 30, and December 1st, 1898. The board was represented by S. W. Atkinson and F. P. Ruhl. The society was re-organized by the election of the following officers:
H. A. Hartley, President, Masontown.
Col. J. W. Brown, Vice-President, Kingwood.
D. J. Walls, Secretary and Treasurer, Kingwood.
The estimated attendance was 60.

No. 16. The first annual meeting of the Farmers' Institute Society of Monongalia County was held at Cassville, on December 2nd and 3rd, 1898. The board was represented by S. W. Atkinson, T. C. Atkeson and F. P. Ruhl. The Experiment Station was represented by Jas. H. Stewart, Messrs. Corbett, Hite and Rumsey, and by Messrs. Hackney, Eakin and Naret. The society was re-organized by the election of the following officers:
M. L. Core, President, Cassville.
W. A. Loar, Vice-President, Laurel Point.
H. W. Fleming, Secretary, Cassville.
Joseph Cole, Treasurer, Cassville.
The estimated attendance was 150.

No. 17. The first annual meeting of the Farmers' Institute Society was held at Farmington, November 5, 6, 1898. The board was represented by S. W. Atkinson and F. P. Ruhl. The Station by Hon. J. H. Stewart, Director. The society was re-organized by the election of the following officers:
M. L. Fleming, President, Fairmont.
James Hayhurst, Vice-President, Fairmont.
Z. F. Davis, Secretary and Treasurer, Worthington.
The estimated attendance was 100.

No. 18. The first annual meeting of the Taylor County Farmers' Institute Society was held at Pruntytown, December 8, 9, 1898. The board was represented by Prof. T. C. Atkeson, H. W. Miller and F. P. Ruhl, and the Station by Jas. H, Stewart. The society was re-organized by the election of the following officers:
G. W. Reynolds, President, Pruntytown.

J. Howard Cather, Vice-President, Flemington.
J. T. Whitescarver, Secretary, Pruntytown.
G. C. Brohard, Treasurer, Flemington.
The estimated attendance was 100.

No. 19. The ninth annual meeting of the Ohio County Farmers' Institute was held at West Liberty; West Virginia, December 16, 17, 1898. The board was represented by Messrs. Atkinson and Atkeson. The officers elected previously were:
J. B. Garvin, President, Wheeling.
Abram McCulloch, Vice-President, West Liberty.
Thos. J. Orr, Secretary, Roney's Point.
George Hand, Treasurer, Elm Grove.
There was no election at this meeting. The estimated attendance was 500.

No. 20. The fourth annual meeting of the Hancock County Farmers' Institute was held at Fairview, on December 21, 22, 1898. Owing to sickness and other unavoidable causes the board and Station were not represented at this splendid meeting. The following officers were re-elected:
P. A. Pugh, President, Fairview.
W. N. Bell, Vice-President, Fairview.
C. F. Allison, Secretary, Mercer.
R. H. Brown, Treasurer, Linton, Ohio.
Attendance; 800.

No. 21. The first annual meeting of the Mason County Farmers' Institute was held in Beall's Chapel, December 21, 22, 1898. (Society No. 2). The board was represented by its Secretary D. M. Sullivan and Dr. F. P. Ruhl, V. S. The society was re-organized by the election of the following officers:
S. W. Moore, President, Elwell.
H. C. Skinner, Vice-President, Pliny.
G. W. Wallace, Secretary, Hogsett.
The estimated attendance was 200.

No. 22. The sixth annual meeting of the State Horticultural Society was held at Charleston, West Virginia, February 7th, 1899. The board was represented by Messrs. Atkinson, Sydenstricker, Rathburn, Atkeson, Sullivan and Brown. The officers of the society are as follows:
R. C. Burkhart, President, Martinsburg.
John H. Crawford, Vice-President, Organ Cave.
L. C. Corbett, Secretary, Morgantown.
The estimated attendance was 100.

No. 23. The sixth annual meeting of the State Wool Growers' and Sheep Breeders' Association was held at Charleston, February 8th, 1899. The board was represented by Messrs. Atkinson, Rathburn, Atkeson, Sydenstricker, Sullivan and Brown. The Station by Director James H. Stewart and Prof. L. C. Corbett. The officers of this society are:

Sam'l C. Gist, President, Wellsburg.
J. J. Echols, Vice-President, Lewisburg.
Jas. Beall, Secretary, Independence, Penna.
C. C. Brown. Corresponding Secretery, Charleston.
The estimated attendance was 100.

No. 24. The first annual meeting of the State Farmers' Institute Society was held at Charleston, February 8th, 1899. The officers elected were as follows:

C. C. Brown, President, Charleston.
James George, Vice-President, Ashton.
D. M. Sullivan, Secretary, Charleston.
T. J. Mahan, Treasurer, Steubenville, Ohio.
The estimated attendance, 100.

No. 25. The seventh annual meeting of the Brooke County Farmers' Institute was held at the Tent U. P. church, in Cross creek district, March 1st and 2nd, 1899. The board was represented by S. W. Atkinson and C. C. Brown. The society was re-organized by electing George T. Hemphill of Colliers, president, and authorized him to select his own assistants. Estimated attendance 400.

No. 26. The second annual meeting of the Marshall County Farmers' Institute Society was held in the school building in Pleasant Valley, March 3rd and 4th, 1899. The board was represented by S. W. Atkinson and the Station by James H. Stewart. W. S. Phillips, of Calls was elected president. The estimated attendance was 50.

No. 27. The ninth annual meeting of the Ohio County Farmers' Institute Society was held at Elm Grove, West Virginia, March 6th and 7th, 1899. The board was represented by Messrs. Atkinson and Brown. The society was re-organized by the election of the following officers:

Abram McCulloch, President, Elm Grove.
James Orr, Vice President, Roneys Point.
J. B. Garvin, Secretary, Wheeling.
The estimated attendance 400.

No. 28. The first annual meeting of the Marshall County Farmers' Institute Society No. 2, was held at Cameron, March 8th and 9th, 1899. The board was represented by C. C. Brown and the station by James H. Stewart. The society was re-organized by the election of the following officers:

B. L. Crow, President, Rock Lick.
J. C. Lough, Vice President, Cameron.
J. M. Rine, Secretary and Treasurer, Wells.
The estimated attendance was 75.

No. 29. The second annual meeting of the Wetzel County Farmers' Institute Society was held at New Martinsville, March 10 and 11, 1899. The board was represented by Messrs. S. W. Atkinson and C. C. Brown. The society was re-organized by the election of the following officers:
J. S. Robinson, President, Smithfield.
William Brown, Vice President, New Martinsville.
S. R. Martin, Secretary, New Martinsville.
The estimated attendance was 60.

No. 30. The second annual meeting of the Pleasants County Farmers' Institute Society was held at St. Mary's, March 20 and 21st, 1899. The board was represented by Messrs. Atkinson, Atkeson and Brown, and the station by James H. Stewart. The society was re-organized by the election of the following officers:
B. F. Seckman, President, Adlai.
R. H. Browse, Vice President, Grape Island.
J. E. Cochran, Secretary, Salama.
The estimated attandance was 200.

No. 31. The first annual meeting of the Wood County Farmers' Institute Society was held at Williamstown, March 22nd, 1899. The board was represented by Messrs. Atkeson and Brown. The station by Jas. H. Stewart. The society was re-organized by the election of the following officers:
H. C. Henderson, President, Williamstown.
J. W. Johnson, Vice President, Williamstown:
C. H. Athey, Secretary and Treasurer, Athey.
The estimated attendance was 30.

No. 32. The second annual meeting of the Wirt County Farmers' Institute Society was held at Elizabeth, March 24th 25th, 1899. The board was represented by Messrs. Miller, Atkinson, Atkeson and Brown. The society was re-organized by the election of the following officers:
J. H. Bumgardner, President, Elizabeth.
M. V. Vernon, Vice President, Reedy Ripple.
Willie Fought, Secretary, Newark.
G. W. Roberts, Treasurer, Elizabeth.
The estimated attendance was 400.

No. 33. The second annual meeting of the Wood County Farmers' Institute Society was held at Belleville, March 27th and

28th, 1899. The board was represented by Messrs. Atkinson, Miller, Atkeson and Brown. The Station by Prof. L. C. Corbett. The society was re-organized by the election of the following officers:

P. F. Wells, President, Belleville.
Alex. Boso, Vice-President, Flinn.
S. D. Humphreys, Secretary, Belleville.
The estimated attendance was 150.

No. 34. The second annual meeting of the Roane County Farmers' Institute Society was held at Spencer, March 19th and 20th, 1899. The Board was represented by President S. W. Atkinson. The society was re-organized by the election of the following officers:

H. B. Hughes, President, Spencer.
M. L. Vandermiller, Vice-President, Roxalana.
C. W. Llewellyn, Secretary, Penial.
The estimated attendance was 110.

No. 35. The first annual meeting of the Jackson County Farmers' Institute Society was held at Ravenswood, April 1st, 1899. The board was represented by Messrs. Atkinson and Brown. The society was re-organized by the election of the following officers:

E. E. Cross, President, Ravenswood.
J. S. Brown, Vice-President, Sandyville.
C. T. Perry, Secretary and Treasurer, Cuba.
The estimated attendance was 150.

No. 36. The third annual meeting of the Ritchie County Farmers' Institute was held at Pennsboro, April 14th and 15th, 1899. The board was represented by T. C. Atkeson and C. C. Brown. The society was re-organized by the election of the following officers:

B. Ball, President, Goose Creek.
W. H. Pyles, Vice-President, Hebron.
D. A. Fawcett, Secretary, Pennsboro.
J. C. Johnson, Treasurer, Tollgate.
The estimated attendance was 500.

No. 37 The fifth annual meeting of the Berkeley County Farmers' Society was held at Martinsburg, April 19th and 20th, 1899. The board was represented by Messrs. Miller and Brown. The Station by Prof. L. C. Corbett. The society was re-organized by the election of the following officers:

S. L. Dodd, President, Little Georgetown.
J. W. B. Evans, Vice-President, Martinsburg.
E. W. Lupton, Secretary and Treasurer, Martinsburg.
The estimated attendance was 100.

No. 38. The second annual meeting of the Jefferson County Farmers' Institute Society was held at Charles Town, April 21st and 22nd, 1899. The board was represented by Messrs. Miller and Brown. The society was re-orgarized by the election of the following officers:

J. H. Strider, President, Leetown.
Adam Brenneman, Vice-President, Rippon.
Milton Burr, Secretary and Treasurer, Bardane.
The estimated attendance was 75.

No. 39. The second annual meeting of the Morgan County Farmers' Institute Society was held at Berkeley Springs, April 24th and 25th, 1899. The board was represented by Messrs. Miller and Brown. The society was re-organized by the election of the following officers:

W. R. Mendenhall, President, Sir John's Run.
Rev. M. L. Mayselles, Vice-President, Munson.
P. W. Atkinson, Secretary and Treasurer, Berkeley Springs.
The estimated attendance was 300.

No. 40. The second annual meeting of the Hampshire County Farmers' Institute Society was held at Romney, April 27th, 1899. The board was represented by S. W. Atkinson and C. C. Brown. The society was re-organized by the election of the following officers:

Garrett W. Parsons, President, Romney.
R. F. Ruley, Vice-President, Capon Bridge.
A. B. C. Whittaker, Secretary and Treasurer, Romney.
The estimated attendance was 80.

No. 41. The second annual meeting of the County Farmers' Institute Society was held at Burlington, April 28th and 29th, 1899. The board was represented by S. W. Atkinson and C. C. Brown. The society was re-organized by the election of the following officers:

Capt. J. W. Vandiver, President, Burlington.
Taylor Arnold, Vice President, Burlington.
D. A. Arnold, Secretary and Treasurer, Ridgeville.
The estimated attendance was 300.

No. 42. The second annual meeting of the Hardy County Farmers' Institute Society was held at Moorefield, May 1st and 2nd, 1899. The board was represented by S. W. Atkinson and C. C. Brown. The society was re-organized by the election of the following officers:

Geo. T. Leatherman, President, Old Fields.
George K. Judy, Vice President, Old Fields.
E. W. McNeill, Secretary and Treasurer, Old Fields.
The estimated attendance was 80.

No. 43. The second annual meeting of the Grant County Farmers' Institute was held at Petersburg on May 3rd and 4th, 1899. The board was represented by Messrs. Atkinson and Brown. The society was re-organized by the election of the following officers:

S. B. McNemar, President, Lahmansville.
J. L. Foreman, Vice President, Petersburg.
J. Ed. Fry, Secretary, Petersburg.
D. P. Hendrickson, Treasurer, Petersburg.
The estimated attendance was 300.

No. 44. The second meeting of the Pendleton County Farmers' Institute was held at Upper Tract, May 5th and 6th, 1899. The board was not represented and the station was represented by Director James H. Stewart. The election of officers was postponed until the meeting of the same society in the same county at Franklin on May 8th and 9th.

No. 45. The third annual meeting of the Pendleton County Farmers' Institute Society was held at Franklin on May 8th and 9th, 1899. The board was represented by C. C. Brown. The following officers were then elected:

Frank Anderson, President, Franklin.
Wm. C. Kiser, Vice President, Franklin.
J. W. Byrd, Secretary and Treasurer, Franklin.
The estimated attandance was 200.

No. 46. The fifth annual meeting of the Greenbrier Farmers, Institute Society was held at Lewisburg on March 19th and 20th, 1899. The board was represented by J. M. Sydenstricker and C. C. Brown. The society was reorganized by the election of the following officers:

A. M. McLaughlin, President, Lewisburg.
M. A. Jackson, Vice President, Lewisburg.
C. E. Lewis, Secretary, Savannah.
The estimated attendance was 150.

No. 47. The third annual meeting of the Monroe County Farmers' Institute Society was held at Union on May 23 and 24, 1899. The board was represented by Messrs. Sydenstricker and Brown. The society was re-organized by the election of the following officers:

W. B. Morton, President, Johnsons' Cross Roads.
Jas. A. Dunlap, Vice President, Union.
Shelton Clark, Secretary, Union.
The estimated attendance was 150.

No. 48. The first annual meeting of the Greenbrier Valley Farmers' Institute Society met at Alderson, May 27th, 1899.

The board was represented by Messrs. Sydenstricker and Brown. The society was re-organized by the election of the following officers:

James Mann, President, Alderson.
J. G. Alderson, Vice President, Wolf Creek.
H. T. Houston, Secretary and Treasurer, Alderson.
The estimated attendance was 50.

No. 49. The second annual meeting of the Farmers' Institute Society of Summers County was held at Hinton, May 29 and 30, 1899. The board was represented by C. C. Brown. The society was re-organized by the election of the following officers:

J. D. Martin, President, Neponset.
T. A. George, Vice President, Green Sulphur Springs.
G. W. Leftwich, Secretary, Indian Mills.
The estimated attendance was 100.

No. 50. The first annual meeting of the Summers County Farmers' Institute Society No. 2, was held at Forest Hill on May 31 and June 1st, 1899. The board was represented by Secretary D. M. Sullivan and James George, of Mason county. The society was reorganized by the election of the following officers:

I. D. Martin, President, Neponset.
J. W. Allen, Vice-President, Indian Mills.
A. M. Hutcheson, Secretary and Treasurer, Forest Hill.
The estimated attendance was 200.

No. 51. The first annual meeting of the Mercer County Farmers' Institute Society was held at the Normal School Building at Athens on June 2nd and 3rd, 1899. The board was represented by Messrs. Sullivan and George. The society was reorganized by the election of the following officers:

George W. Devor, President, Athens.
Daniel C. Petty, Vice-President, Athens.
R. N. Vermillion, Secretary, Athens.
The estimated attendance was 500.

No. 52. The second annual meeting of the Raleigh County Farmers' Society was held at Beckley, June 6th and 7th, 1899. The board was represented by Messrs. Sullivan and George. The society was re-organized by the election of the following officers:

H. M. Riffe, President. Beckley.
J. W. McCreery, Vice-President, Beckley.
M. A. Ellison, Secretary, Beckley.
The estimated attendance was 150.

No. 53. The second annual meeting of the Tyler County

Farmers' Institute was held at Middlebourne on July 26, 1899. The board was represented by T. C. Atkeson and C. C. Brown. The society was re-organized by the election of the following officers:

A. L. Corbly, President, Bearsville.
Arthur Ankrom, Vice-President, Kidwell.
H. W. Smith, Secretary and Treasurer, Middlebourne.
The estimated attendance was 200.

No. 54. The second annual meeting of the Nicholas County Farmers' Institute Society was held at Summersville, August 8th and 9th, 1899. The board was represented by T. C. Atkeson and D. M. Sullivan. The society was re-organized by the election of the following officers:

L. L. Winebrimmer, President, Winston.
H. W. Herald, Vice-President, Muddlety.
A. J. Legg, Secretary and Treasurer, Albion.
The estimated attendance was 75.

No. 55. The second annual meeting of the Clay County Farmers' Institute was held at Clay Court House August 12th, 1899. The board was represented by T. C. Atkeson and C. C. Brown. The society was re-orgahized by the election of the following officers:

Abram Lewis, President, Yankee Dam.
John A. Humphrey, Vice-President, Wattsville.
W. P. Gouly, Secretary and Treasurer, Clay.
The estimated attendance was 60.

No. 56. The second annual meeting of the Boone County Farmers' Institute Society was held at Madison, August 15th, 1899. The board was represented by C. C. Brown and W. C. Henson. The society was re-organized by the election of the following officers:

D. J. Smith, President, Danville.
Jacob Chambers, Vice-President, Danville.
H. L. Carter, Secretary and Treasurer, Madison.
The estimated attendance was 50.

No. 57. The second annual meeting of the Fayette County Farmers' Institute Society was held at Mount Zion, on August 17th, 1899. (Near the Deitz P. O.) The board was represented by C. C. Brown. The society was re-organized by the election of the following officers:

J. W. White, President, Leander.
W. S. McCutcheon, Vice-President, Elliott.
L. P. Wills, Secretary and Treasurer, Mountain Cove.
The estimated attendance was 200.

No. 58. The first annual meeting of the Putnam County Farmers' Institute Society No. 2, was held at Hurricane, August 21-22, 1899. The Board was represented by T. C. Atkeson, James George and the Institute Director, and the station by Director James H. Stewart. The Society was re-organized by the election of the following officers:

Wm. H. McCallister, President, Hurricane.
J. H. Smallridge, Vice-President, Teays.
B. W. Simpson, Secretary and Treasurer, Rena.
The estimated attendance was 250.

No. 59. The second annual meeting of the Cabell County Farmers Institute Society was held at Milton, August 23-24, 1899. The Board was represented by Messrs. George and Atkeson, and the Director. The station by its director, James H. Stewart. The society was re-organized by the election of the following officers:

T. B. Summers, President, Milton.
George W. Harshbarger, Vice-President, Milton.
J. C. Kilgore, Secretary and Treasurer, Milton.
The estimated attendance was 175.

No. 60. The second annual meeting of the Lincoln County Farmers' Institute Society was held at Hamlin, August 24th, 1899. The Board was represented by James George and Director. The society was re-organized by the election of the following officers:

H. F. Wilson, President, Griffithsville.
G. W. Smoot, Vice President, Hamlin.
E. R. Huffman, Secretary and Treasurer, Hamlin.
The estimated attendance was 200.

No. 61. The second annual meeting of the Cabell County Farmers' Institute Society was held at Barboursville, August 25-26, 1899. The Board was represented by James George and the Institute Director. The society was re-organized by the election of the following officers:

P. E. Love, President, Martha.
Frank Brammer, Vice-President, Cox's Landing.
Wm. T. Cox, Secretary and Treasurer, Cox's Landing.
The estimated attendance was 200.

No. 62. The second annual meeting of the McDowell County Farmers' Institute Society was held at Welch on September 13th, 1899. The Board was represented by its Institute Director. The society was re-organized by the election of the following officers:

D. H. Harmon, President, Peeryville.
Jessie Bean, Vice-President, Iaeger.
David Payne, Secretary and Treasurer, Bradshaw.
The estimated attendance was 55.

No. 63. The second annual meeting of the Wyoming County Farmers' Institute Society was held at Oceana, September 15th, 1899. The Board was represented by C. C. Brown. The society was re-organized by the election of the following officers:
C. F. Cook, President, Oceana.
J. W. Cook, Vice-President, Oceana.
R. A. Shannon, Secretary, Oceana.
The estimated attendance was 50.

No. 64. The second annual meeting of the Mingo County Farmers' Institute Society was held at Williamson, September 18th, 1899. The Board was represented by C. C. Brown. The society was re-organized by the election of the following officers:
Alex. Safford, President, Gilbert.
Dave Trent, Vice-President, Gilbert.
Byron Christian, Secretary, Gilbert.
The estimated attendance was small.

No. 65. The second annual meeting of the Logan County Farmer's Institute Society was held at Logan on September 20th, 1899. The Board was represented by C. C. Brown. The society was re-organized by the election of the following officers:
J. R. Henderson, President, Logan.
H. C. Rayland, Secretary, Logan.
L. D. Chambers, Vice-President, Logan.
The estimated attendance was small.

No. 66. The second annual meeting of the Wayne County Farmer's Institute Society was held at Wayne on September 22-23, 1899. The Board was represented by C. C. Brown. The society was re-organized by the election of the following officers:
W. B. Garrett, President, Dixon.
C. W. Ferguson, Vice-President, Wayne.
L. B. Jarrell, Secretary, Wayne.
The estimated attendance was 200.

No. 67. The first annual meeting of the Upshur County Farmers' Institute Society was held at Alexander on September 29-30, 1899. The Board was represented by its President, S. W. Atkinson, and Dr. F. P. Ruhl. The society was re-organized by the election of the following officers:
James Shahan, President, Palace Valley.
J. A. Boyles, Vice-President, Alexander.
T. A. Gilmer, Secretary, Alton.
The estimated attendance was 50.

No. 68. The third annual meeting of the Upshur County Farmers' Institute Society was held at Buckhannon on October 2, 3, 1899. The board was represented by President At-

kinson, Dr. Ruhl and C. C. Brown. The society was re-organized by the election of the following officers:
Joseph S. Reger, President, Rural Dale.
William Means, Vice-president, Buckhannon.
Alvin Carper, Secretary, Buckhannon.
The estimated attendance was 150.

No. 69. The second annual meeting of the Lewis County Farmers' Institute Society was held at Weston on October 4th, 1899. The board was represented by Dr. F. P. Ruhl and C. C. Brown. The society was re-organized by the election of the following officers:
J. E. Norris, President, Freemansburg.
W. J. Nichols, Vice-President, Gaston.
Perry G. Alfred, Secretary, Weston.
The estimated attendance was small.

No. 70. The second annual meeting of the Gilmer County Farmers' Institute Society was held at Glenville, October 6, 7, 1899. The Board was represented by its Secretary, D. M. Sullivan. The society was re-organized by the election of the following officers:
C. B. Bush, President, Cox's Mills.
B. F. Childers, Vice-President, Cedarville.
Mrs. C. N. Brooks, Secretary, Cedarville.
The estimated attendance was 75.

No. 71. The second annual meeting of the Braxton County Farmers' Institute Society was held at Sutton, October 6-7, 1899. The Board was represented by C. C. Brown. The society was re-organized by the election of the following officers:
Henry Bender, President, Chapel.
Granville Carlin, Vice-President, Falls Mills.
R. B. Norris, Secretary, Sutton.
The estimated attendance was 100.

No. 72. The second annual meeting of the Calhoun County Farmers' Institute Society was held at Grantsville, on October 9th, 1899. The Board was represented by C. C. Brown. The society was re-organized by the election of the following officers:
G. W. Maze, President, Big Bend.
Emery Ball, Vice-President, Mt. Zion.
S. M. McCoy, Secretary, Richardson.
The estimated attendance was poor and the interest "no good."

No. 73. The second annual meeting of the Webster County Farmers' Institute Society was held at Cowen, on October 10-11, 1899. The Board was represented by C. C. Brown. The

society was re-organized by the election of the following officers:
M. L. Shriver, President, Cowen.
Dr. D. P. Kessler, Vice-President, Cowen.
Wallace Hollister, Secretary, Cowen.
The estimated attendance was 75.

No. 74. The seventh annual meeting of the State Horticultural Society was held at Lewisburg, October 17th, 1899. All the members of the Board were present. The society was re-organized by the election of the following officers:
R. C. Burkhart, President, Martinsburg.
Jno. H. Crawford, Vice-President, Organ Cave.
L. C. Corbett, Secretary, Morgantown.
The estimated attendance was 100.

No. 75. The seventh annual meeting of the Sheep Breeders and Wool Growers Association was held in Lewisburg, on October 18th, 1899. All the members and officers of the Board were present. The following officers were elected for the ensuing year:
S. C. Gist, President, Wellsburg.
J. J. Echols, Vice-President, Lewisburg.
Jas. Beall, Secretary, Wellsburg.
J. B. Garvin, Assistant Secretary, Charleston.
The estimated attendance was 125.

No. 76. The first annual meeting of the Farmers' Institute Society of Green Sulphur District, Summers county, was held at Green Sulphur, on October 20-21, 1899. The board was represented by its President S. W. Atkinson and Secretary D. M. Sullivan. The society was re-organized by the election of the following officers:
J. W. Alderson, President, Green Sulphur.
J. L. Brown, Vice President, Green Sulphur.
J. L. George, Secretary, Green Sulphur.
The estimated attendance was 150.

No. 77. The fourth annual meeting of the Mason County Farmers' Institute was held at Mount Union, October 23rd and 24th, 1899. The board was represented by Pres. S. W. Atkinson, the Station by Director James H. Stewart. The society was re-organized by the election of the following officers:
W. H. King, President, Arbuckle.
H. C. Skinner, Vice President, Pliny.
George E. Skinner, Secretary, Pliny.
The estimated attendance was 200.

No. 78. The third annual meeting of the Wetzel County Farmers' Institute Society was held at New Martinsville, November 3-4, 1899. The board was represented by T. C. Atkeson and D. M. Sullivan. The society was re-organized by the election of the following officers:

A. T. Morris, President, Maud.
B. B. Newman, Secretary, Bebee.
John Krebs, Vice President, ——
The estimated attendance was small.

No. 79. The third annual meeting of the Tyler County Farmers' Institute Society was held at Shilo, November 6-7, 1899. The board was represented by Secretary D. M. Sullivan. The society was re-organized by the election of the following officers:

Selmen Wells, President, Josiah.
J. T. Hughes, Secretary, Little.
J. J. Gornell, Vice President, Best.
The estimated attendance was 300.

No. 80. The third annual meeting of the Pleasants County Institute was held at St. Mary's, November, 8-9, 1899. The board was represented by D. M. Sullivan. The Experiment Station by Prof. Atwood. The institute was re-organized by the election of the following officers:

G. D. Stout, President, Union Mills.
J. B. McFarland, Vice President.
J. E. Cochran, Secretary, Salama.
The estimated attendance was 75.

No. 81. The third annual meeting of the Wood County Farmers' Institute Society was held at Belleville, November 3-4, 1899. The board was represented by President S. W. Atkinson. The society was re-organized by the re-election of its old officers:

P. F. Wells, President, Belleville.
Alex Boso, Vice President, Belleville.
S. D. Humphries, Secretary, Belleville.
The estimated attendance was small.

No. 82. The third annual meeting of the Wirt County Farmers' Institute Society was held at Elizabeth, November 6-7, 1899. The board was represented by President S. W. Atkinson. The society was re-organized by the election of the following officers:

J. H. Baumgardner, President, Elizabeth.
M. V. Vernon, Vice President, Reedy Ripple.
C. R. Hennemen, Secretary, Elizabeth.
The estimated attendance was 30.

No. 83. The second annual meeting of the Wood County Farmers' Institute Society was held at Williamstown, November

8–9, 1899. The board was represented by President S. W. Atkinson. The society was re-organized by the election of the following officers:

H. C. Henderson, President, Williamstown.
E. E. McTaggart, Secretary, Williamstown.
J. W. Johnson, Vice President.

The estimated attendance was 100.

No. 84. The second annual meeting of the Marion County Farmers' Institute was held at Rivesville, December 1st and 2nd, 1899. The board was represented by S. W. Atkinson, T. C. Atkeson and Dr. F. P. Ruhl, and the Experiment Station by James H. Stewart. The society was re-organized by the election of the following officers:

D. D. Cunningham, President, Rivesville.
Elbert Jones, Secretary, Rivesville.

The estimated attendance was 75.

No. 85. The sixth annual meeting of the Berkeley County Farmers' Institute was held at Cherry Grove Grange, West Virginia, December 4th and 5th, 1899. The board was represented by President Atkinson and T. C. Atkeson. The society was re-organized by the election of the following officers:

S. L. Dodd, President, Little Georgetown.
J. W. B. Evans, Vice President, Martinsburg.
E. W. Lupton, Secretary, Martinsburg.

The estimated attendance was 75.

No. 86. The second annual meeting of the Tucker County Farmers' Institute was held in St. George, December 8–9, 1899. The board was represented by C. C. Brown. The society was re-organized by the election of the following officers:

G. L. Phillips, President, St. George.
C. L. Parsons, Vice President, St. George.
J. A. Swisher, Secretary, Lead Mines.

Attendance not estimated but very good.

No. 87. The second annual meeting of the Randolph County Farmers' Institute was held at Huttonsville, December 11–12, 1899. The board was represented by Secretary D. M. Sullivan. The society was re-organized by the election of the following officers:

Woodford Hutton, President, Huttonsville.
T. H. Ward, Vice President, Huttonsville.
Patrick Crickard, Secretary, Crickard.

No. 88. The second annual meeting of the Barbour County Farmers' Institute was held at Philippi, December 13–14, 1899. The board was represented by President S. W. Atkinson, Dr. F.

P. Ruhl, T. C. Atkeson and D. M. Sullivan, and the Experiment Station by Director Jas. H. Stewart. The society was re-organized by the election of the following officers:

W. D. Zinn, President, Philippi.
W. S. Lang, Vice-President, Meadowville.
James O'Neal, Secretary, Elk City.
Attendance not estimated.

No. 89. The second annual meeting of the Taylor County Farmers' Institute was held at Pruntytown on December 14–15, 1899. The board was represented by T. C. Atkeson, Dr. Ruhl and D. M. Sullivan. The Experiment Station by Director J., H. Stewart. The society was re-organized by the election of the following officers:

G. W. Reynolds, President, Pruntytown.
J. H. Cather, Vice-President, Flemington.
J. T. Whitescarver, Secretary, Pruntytown.
The estimated attendance was 150.

No. 90. The third annual meeting of the Ritchie County Farmers' Institute Society was held at Harrisville, December 18–19, 1899. The board was represented by Dr. F. P. Ruhl and D. M. Sullivan. The Station by Director Jas. H. Stewart. The society was reorganized by the election of the following officers:

M. A. Ayres, President, Smithville.
B. Beall, Vice-President, Goose Creek.
F. M. Moats, Secretary, Harrisville.
The estimated attendance was 350.

No. 91. The third annual meeting of the Morgan County Farmers' Institute was held at Berkeley Springs, December 6–7, 1899. The board was represented by T. C. Atkeson and the station by Jas. H. Stewart. The society was re-organized by the election of the following officers:

W. R. Mendenhall, President, Sir Johns Run.
R. M. Fisher, Secretary, Berkeley Springs.
The estimated attendance was 75.

No. 92. The fifth annual meeting of the Hancock County Farmers' Institute Society was held at Fairview, Jan. 3–4, 1900. The Board was represented by its President, S. W. Atkinson. The society was re-organized by the election of the following officers:

P. A. Pugh, President, Fairview.
W. N. Bell, Vice President, Mercer.
C. F. Allison, Secretary, Mercer.
The estimated attendance was 350.

No. 93. The eighth annual meeting of the Brooke County

Farmers' Institute Society was held at Cross Creek District, January 10-11, 1900. The Board was represented by S. W. Atkinson, James George and T. C. Atkeson. The society was re-organized by the election of the following officers:
G. E. Hemphill, President, Colliers.
A. L. Carter, Vice President, Wellsburg.
Miss Elmira J. Morton, Secretary, Colliers.
The estimated attendance was 300.

No. 94. The tenth annual meeting of the Ohio Farmers' County Institute Society, No. 2, was held at West Liberty, Jan. 12-13, 1900. The Board was represented by S. W. Atkinson, James George and D. M. Sullivan. The society was re-organized by the election of the following officers:
Abram McCulloch, President, Clinton.
James Orr, Vice President, Roneys Point.
J. J. Jacob, Secretary, Clinton.
The estimated attendance was 400.

No. 95. The third annual meeting of the Marshall County Farmers' Institute Society was held at Pleasant Valley, on January 10-11, 1900. The Board was represented by D. M. Sullivan. The Experiment Station by James H. Stewart. The society was re-organized by the election of the following officers:
W. S. Phillips, President, Calis.
S. Dorsey, Vice President, Pleasant Valley.
D. W. Stewart, Secretary, Pleasant Valley.
The estimated attendance was 350.

No. 96. The second annual meeting of the Monongalia County Farmers' Institute Society was held at Laurel Point, January 15-16, 1900. The Board was represented by Prof. T. C. Atkeson. The Experiment Station by Professors Corbett and Howard. The society was re-organized by the election of the following officers:
John C. Price, President, Uffington.
Geo. W. Laishley, Vice President, Easton.
H. W. Fleming, Secretary, Cassville.
The estimated attendance was fair.

No. 97. The second annual meeting of the Preston County Farmers' Institute Society was held at Kingwood, on February 3rd, 1900. The Board was represented by D. M. Sullivan. The society was re-organized by the election of the following officers:
H. A. Hartley, President, Masontown.
W. Brown, Vice-President, Kingwood.
A. F. McMillan, Secretary, Masontown.
The estimated attendance was 100.

No. 98. The second annual meeting of the Harrison County Farmers' Institute was held at Bridgeport, February 5th and 6th, 1900. The Board was represented by T. C. Atkeson and D. M. Sullivan. The society was re-organized by the election of the following officers:

James Duncan, President, Bridgeport.
H. R. McCord, Vice-President, Clark.
Jas. F. Allen, Secretary, Clarksburg.
The estimated attendance was 40.

No. 99. The third annual meeting of the Doddridge County Farmers' Institute was held in West Union, on February 7th and 8th, 1900. The Board was represented by T. C. Atkeson and D. M. Sullivan. The society was re-organized by the election of the following officers:

E. G. Taylor, President, Morgansville.
Walter Hall, Vice-President, St. Clara.
G. P. Smith, Secretary, West Union.

No. 100. The third annual meeting of the Wood County Farmers' Institute was held in Belleville, on February 9th and 10th, 1900. The meeting was re-organized by the election of the following officers, and the Board was represented by S. W. Atkinson, James George and D. M. Sullivan:

P. F. Wells, President, Belleville.
Alex. Boso, Vice-President, Belleville.
S. D. Humphreys, Secretary, Belleville.
The estimated attendance was 75.

No. 101. The second annual meeting of the Jackson County Farmers' Institute was held at Ravenswood, February 12th and 13th, 1900. The Board was represented by S. W. Atkinson, James George and D. M. Sullivan. The society was re-organized by the election of the following officers:

J. E. Brown, President, Sandyville.
C. T. Perry, Secretary, Cuba.
Attendance 150.

No. 102. The third annual meeting of the Roane County Farmers' Institute was held February 14th and 15th, 1900, at Spencer. The Board was represented by S. W. Atkinson, James George and D. M. Sullivan. The Institute was re-organized by the election of the following officers:

H. B. Hughes, President, Spencer.
M. L. Vandevander, Vice-President, Roxalana.
C. W. Llewellyn, Secretary, Peniel.
The estimated attendance was 100.

No. 103. The first annual meeting of the Mason County Farmers' Institute was held at Elmwood, on February 17th, 1900. The Board was represented by James George and D. M. Sullivan. The society was re-organized by the election of the following officers:

J. T. Morris, President, Elmwood.
A. L. C. Durham, Vice-President, Deerlick.
S. W. King, Secretary, Elmwood.
Estimated attendance not exceeding 25.

No. 104. The tenth annual meeting of the Ohio County Farmers' Institute was held at Elm Grove, February 20 and 21st, 1900. The Board was represented by S. W. Atkinson, T. C. Atkeson and J. B. Garvin, and the Experiment Station by Prof. B. H. Hite. The Institute was re-organized by the election of the following officers:

Abram McColloch, President, Clinton.
J. C. Orr, Vice-President, Roney's Point.
W. P. Wayman, Secretary, Wheeling.
The estimated attendance was 200.

No. 105. The second annual meeting of the Mason County Farmers's Institute was held at Hannah Grange Hall, March 5th and 6th, 1900. The board was represented by James George Stewart and D. M. Sullivan. The Experiment Station by James H. The institute was re-organized by the election of the following officers:

S. W. Moore, President, Elwell.
Henry Gwinn, Vice-President, Glenwood.
G. W. Wallace, Secretary, Hogsett.
The estimated attendance was 75.

No. 106. The fifth annual meeting of the Putnam County Farmers' Institute was held at Buffalo, March 7th and 8th, 1900. The board was represented by J. B. Garvin and D. M. Sullivan. The institute was re-organized by the election of the following officers:

C. C. Brown, President, Buffalo.
G. E. Allen, Vice-President, Buffalo.
J. H. Collins, Secretary, Buffalo.
The estimated attendance was 125.

No. 107. The second annual meeting of the Kanawha County Farmers' Institute was held at St. Albans, March 10th, 1900. The board was represented by J. B. Garvin and D. M. Sullivan. The Institute was re-organized by the election of the following officers:

George Miller, President, St. Albans.
Mell Moore, Vice-President, St. Albans.
S. C. Blair, Secretary, St. Albans.
The estimated attendance was 35.

No. 108. The second annual meeting of the Putnam County Institute No. 2 was held at Hurricane, April 9th and 10th, 1900. The Board was represented by S. W. Atkinson, J. B. Garvin and D. M. Sullivan. The Institute was re-organized by the election of the following officers:
J. J. Estes, President, Teays.
A. Z. Hearn, Vice-President, Hurricane.
M. R. Chapman, Secretary, Hurricane.
The estimated attendance was 125.

No. 109. The third annual meeting of the Cabell County Farmers' Institute was held at Blue Sulphur Springs, April 11th and 12th, 1900. The Board was represented by S. W. Atkinson, J. B. Garvin and D, M. Sullivan. The Institute was re-organized by the election of the following officers:
P. E. Love, President, Barboursville.
J. J. Kuhn, Vice-President, Barboursville.
M. T. Cox, Secretary, Cox's Landing.
The estimated attendance was 100.

No. 110. The third annual meeting of the Wayne County Farmers' Institute was held at Wayne, on April 13th, 1900. The Board was represented by James George, Secretary Garvin and D. M. Sullivan. The Institute was re-organized by the election of the following officers:
W. B. Garrett, President, Dickson.
Walter Osborn, Vice-President, East Lynne.
J. K. McClure, Secretary, Herbert.
The estimated attendance was 125.

No. 111. The third annual meeting of the Boone County Farmers' Institute was held at Madison, April 17th, 1900. The Board was represented by D. M. Sullivan. The Institute was re-organized by the election of the following officers:
D. J. Smoot, President, Danville.
Dr. L. Carter, Secretary, Madison.
Jacob Chambers, Vice-President, Danville.
The estimated attendance was 35.

No. 112. The Second District Farmers' Institute was held at Sand Fork, Gilmer County, on May 12th, 1900. The Board was represented by D. M. Sullivan. Mrs. C. M. Brooks, who was County Secretary, was much commended for her good and persistent work which made this meeting quite a success.
Estimated attendance 50.

No. 113. The first annual meeting of the Harrison County Farmers' Institute No. 2 was held at Shinnston, May 17th, 1900. The Board was represented by T. C. Atkeson and D. M. Sullivan.
Attendance about 125.

No. 114. The first annual meeting of the Preston County Farmers' Institute was held at Newberg, on May 19th, 1900. The Board was represented by D. M. Sullivan. The Institute was re-organized by the election of the following officers:

J. N. Mays, President, Independence.
William Jennings, Vice-President, Evansville.
William Longridge, Secretary, Fellowsville.
Estimated attendance only 15.

No. 115. The third annual meeting of the Mineral County Farmers' Institute was held at Keyser, on May 21st, 1900. The Board was represented by President Atkinson and D. M. Sullivan. The Experiment Station by J. H. Stewart, its Director. The Institute was re-organized by the election of the following officers:

Capt. J. W. Vandiver, President, Burlington.
Taylor Arnold, Vice-President, Burlington.
D. A. Arnold, Secretary, Ridgeville.
The estimated attendance was 150.

No. 116. The third annual meeting of the Grant County Farmers' Institute was held at Petersburg, May 23rd, 1900. The Board was represented by S. W. Atkinson and D. M. Sullivan. The society was re-organized by the election of the following officers:

S. B. McNeman, President, Lahmansville.
L. J. Forman, Vice President, Petersburg.
J. Ed Fry, Secretary, Petersburg.
The estimated attendance was 200.

No. 117. The third annual meeting of the Pendleton County Farmers' Institute was held at Franklin, on May 25th, 1900. The Board was represented by S. W. Atkinson and D. M. Sullivan. The society was re-organized by the election of the following officers:

Frank Anderson, President, Franklin.
I. T. Hammer, Vice President, Ruddle.
John McCoy, Secretary, Franklin.
The estimated attendance was 150.

No. 118. The third annual meeting of the Hardy County Farmers' Institute was held at Moorefield, May 28th, 1900. The Board was represented by S. W. Atkinson and D. M. Sullivan. The institute was re-organized by the election of the following officers:

J. W. Wood, President, Lost City.
Jesse Fisher, Vice President, Moorefield.
A. D. Wood, Secretary, Moorefield.
The estimated attendance was 35.

No. 119. The third annual meeting of the Hampshire County Farmers Institute was held at Romney, on May 28th, 1900. The Board was represented by Dr. S. E. Hershey and D. M. Sullivan. The institute was re-organized by the election of the following officers:

G. W. Parsons, President, Romney.
A. O. Lovett, Vice President, Capon Bridge.
A. B. C. Whittaker, Secretary, Romney.

The estimated attendance was 50.

No. 120. The second annual meeting of the Mason County Farmers' Institute was held at Elmwood, West Virginia, on June 9th, 1900. The Board was represented by D. M. Sullivan.

The estimated attendance was 75.

No. 121. The third annual meeting of the Summers County Institute was held at Green Sulphur Springs, June 11th and 12th, 1900. The Board was represented by D. M. Sullivan. The institute was re-organized by the election of the following officers:

J. W. Alderson, President, Green Sulphur Springs.
J. D. Martin, Vice President, Neponset.
C. H. Graham, Secretary, Clayton.

The estimated attendance was 150.

No. 122. The third annual meeting of the Raleigh County Farmers' Institute Society was held at Beckley on June 14th. The board was represented by Secretary J. B. Garvin and D. M. Sullivan. The following officers were elected for the following year:

J. W. McCreery, President, Beckley.
J. A. Ewart, Vice-President, Beckley.
D. W. Scott, Secretary, Table Rock.

The estimated attendance was 150.

No. 123. The second annual meeting of the Fayette County Farmers' Institute was held at Oak Hill June 16th, 1900. The board was represented by D. M. Sullivan. The society was re-organized by the election of the following officers:

A. B. Duncan, President, Oak Hill.
W. B. Blake, Vice-President, Dempsey.
L. C. Duncan, Secretary, Oak Hill.

The estimated attendance was 75.

No. 124. The first annual meeting of the Nicholas County Farmers' Institute was held at Tipton, June 20th, 1900. The board was represented by D. M. Sullivan. The institute was held at the close of a week's rain and the farmers were compelled to work their corn.

Attendance not more than 35.

No. 125. The third annual meeting of the Gilmer County Farmers' Institute was held at Cedarville, August 6th, 1900. The board was represented by D. M. Sullivan. The following officers were elected for the coming year:

C. B. Bush, President, Cox's Mill.
B. F. Childers, Vice-President, Cedarville.
A. M. Bush, Secretary, Sandfork.
The estimated attendance was 150.

No. 126. The third annual meeting of the Braxton County Farmers' Institute was held at Sutton, August 8th, 1900. The board was represented by D. M. Sullivan. The following officers were elected for the coming year:

Henry Bender, President, Chapel.
John Adams, Vice-President, Sutton.
W. H. Hiser, Secretary, Moseley.
Estimated attendance 25.

No. 127. The third annual meeting of the Webster County Farmers' Institute was held at Cowen, August 10th, 1900. The board was represented by S. W. Atkinson and D. M. Sullivan. The following officers were elected for the coming year:

M. L. Shriver, President, Cowen.
Wallace Hollister, Secretary, Cowen.
Dr. D. P. Kesler, Vice-President, Cowen.
Estimated attendance 75.

No. 128. The third annual meeting of the Lewis County County Farmers' Institute was held at Berlin, August 14th, 1900. The board was represented by S. W. Atkinson and D. M. Sullivan. The following officers were elected for the coming year:

D. R. Swisher, President, Berlin.
A. G. Gould, Vice-President, Berlin.
E. O. Taylor, Secretary, Vandalia.
The estimated attendance was 250.

No. 129. The fourth annual meeting of the Upshur County Farmers' Institute was held at Buckhannon on August 14th, 1900. The board was represented by S. W. Atkinson and D. M. Sullivan. The society was re-organized by the election of the following officers:

J. S. Reger, President, Buckhannon.
William Means, Vice-President. Buckhannon.
Alvin Carper, Secretary, Buckhannon.
The estimated attendance was 125.

No. 130. The fourth annual meeting of the Doddridge County Farmers' Institute was held at Carr's School House on August 17th, 1900. The board was represented by D. M. Sullivan. The society was re-organized by the election of the following officers:

Isaac Hill, President, Flint.
J. L. Powell, Vice-President, Long Run.
W. N. Frashure, Secretary, Flint.
The estimated attendance was about 50.

No. 131. The first annual meeting of the Doddridge County Farmers' Institute, No. 2, was held at New Milton, on August 18th, 1900. The Board was represented by D. M. Sullivan. The following officers were elected for the ensuing year:

C. B. Robinson, President, Market.
F. F. Randolph, Vice President, New Milton.
Miss Ida Warner, Secretary, New Milton.
The estimated attendance was 75.

No. 132. The fourth annual meeting of the Wood County Farmers' Institute was held at Belleville, on August 20th and 21st, 1900. The Board was represented by T. C. Atkeson and D. M. Sullivan, and the Experiment Station by Dr. A. D. Hopkins. The following officers were elected for the coming year:

Louis Owen, President, Odaville.
C. T. Perry, Vice President, Cuba.
Millard Archer, Secretary.
The estimated attendance was 75.

No. 133. The third annual meeting of the Putnam County Farmers' Institute was held at Hurricane, on August 21st and 22nd, 1900. The Board was represented by T. C. Atkeson, James George and D. M. Sullivan. The Station by Director Jas. H. Stewart. The following officers were elected for the ensuing year:

William H. McCallister, President, Hurricane.
J. H. Smallridge, Vice President, Teays.
B. W. Simpson, Secretary, Rena.
The estimated attendance was 250.

## INSTITUTE PAPERS.

The following papers were read before Farmers' Institutes at different times, and are published to give our readers some idea of the intelligence manifested in the discussions of the various pertinent subjects which naturally arise:

### PRESIDENT S. L. DODD'S ADDRESS.

[Sixth annual meeting of the Berkeley county farmers' institute.]

When God created Adam he placed him in the Garden of Eden, not in a factory, bank, steamboat or railroad. The *garden* seemed to be the place to start him on the "voyage of life." The factory, the bank and the railroad are necessary adjuncts to the modern civilization, and their share of the world's prosperity we accord them. But while we concede the justice of this, the "basis of all avocations" is languishing. The denizens of the farm are so busily employed that they scarcely raise their head to hear a thought expressed for their amelioration.

Like mathematics, the business itself tends to exclusiveness. When once the farmer is aroused to the activities of the commercial, industrial and political world, and sees the great advantages they enjoy, made possible only by organization and combination, and that by his lethargy, he is, alas, too often the victim, insteed of rising in his strength to make his wants known he lapses into his wonted state of plodding and contents himself in his paying his debts by making none, and this often at fearful economy and inconvenience unknown to most of trades and professions. The necessities of the every day life of the industrial world are regarded as luxuries which our business was never intended to afford.

Simplicity of life is the price of our boasted independence. A disrespect for our business often leads us to suffer indignities we accept as due. These conditions must continue to prevail while we illustrate by our methods that the dullest boy is fit only for the farm. Against such a philosophy I protest. Skilled labor should be well paid, be it mercantile, mechanical, professional, or agricultural. Shame that the latter should be one of the great departments of our government last recognized and such an officer as the Secretary of Agriculture be of so recent birth.

There is a brighter day coming, but it will never appear through charity shown us by others. It must be by the result of our own architecture.

We have no quarrel with other trades and professions. Their methods in many instances should be object lessons for our guidance. We must blame ourselves for not seeking the protection of our own interests. Whittier said:

> "Give fools their gold and knaves their power,
> Let Fortune's bubbles rise and fall,
> Who plows a field or trains a flower,
> Or plants a tree is more than all;
> For he who blesses, most is blest,
> And God and man will own his worth
> Who seeks to leave as his bequest
> An added beauty to the earth."

If God and man recognize our worth it is high time we should see it for ourselves. The above sentiment so beautifully expressed by the poet, should inspire every heart, but beyond the sentiment, it adds nothing to our temporal advantage.

This is the vital question with us to-day. How should our business be managed that every honest and industrious man may have a reasonable hope of a competence for his declining years! I maintain that any business, properly managed, should guarantee this, if it be not hedged by some sinister hand that like a parasite, is sapping its life.

The power of organization, so well understood and applied in other spheres, and the necessity for the very highest order of intelligence and skill to successfully cope with competition in their lines are of no more importance to them than to us. If the world has money enough we must study to obtain our share. We deserve it.

There are no problems in mathematics more abstruse, no questions in philosophy more profound, no subject in political economy more complicated than are some of the subjects presenting themselves daily before the tiller of the soil.

Tell us the needs of our soil, and from what sources are they to be supplied, with fertilizer material changing prices. When have we enough of any particular kind, both as to plant and financial results? How shall we acquire a knowledge of the laws of animal nutrition? And when something has been learned, from what sources are these laws to be satisfied so as best to give us a satisfactory return for our skill and pains?

Add to these difficulties the fluctuations in the price of feeding stuffs, when is your feed worth more than your pork, and *vice versa?* A mistake in our conclusions in one or more of these things may determine as between a profit and a loss. Are we pastmasters in this art? If so should not our profits equal those of others whose work is no more scientific? We are here to learn something of our trade, our science, if you please; to become acquainted, to advise and devise.

If these problems be solved by any of you, in the name of humanity don't leave us in the "slough of despond," but do your duty to aid us who flounder in ignorance. Let our deliberations be characterized by desire upon the part of each one to give the true results of his past investigations. Our successes have been built upon a foundation of mistakes. Agriculture has not been an applied science in the past but has been wholly an experiment. While much has been accomplished in this way scientific men are now busy in investigation, and one of their great problems is, how to acquaint us with the result of their labors. Let there be no reticence here. Make the query box your ally. Recognizing the high plain we occupy the world must be taught that we are a power that must be respected.

The idea once prevailed that anybody may be a successful farmer.

A few days ago I overheard a gentleman in a train say he had but little sympathy for the farmer, (he used the right word,) he failed to plant and failed in everything so simple to him. I will venture the assertion that that gentleman was a veritable "Pyrenees of promise and a pismire of performance." There are others of his cult. As he was talking to a lady I could enter no defense. What a pity such fellows have had no opportunity to find out how little they know; had they such a chance they would be likely to think of themselves as did the old colored man of his fish:—

I was told a story in Fairmont the other day of two men who went fishing, taking a negro along as an assistant. They caught but one little fish, but the old colored man captured a fine large bass. Thus ended their luck. The day being warm the negro lay down in the sun with his bass beside him. Falling asleep one of the men exchanged his little fish for the large one then hid near to await the results. Upon awaking the negro observing the supposed effects of the sun, exclaimed: "My Lawd! how dat fish am shrunken!" There are many others both in and out of our business whose ideas of themselves need just such a shrinking.

You never find them at farmers' institutes; they have no time to spend at such foolishness.

If you are all as anxious for the success of this Institute as I am, I am sure you are eager for work.

## AGRICULTURAL EDUCATION.

[Paper read before the Farmers Institute at Summersville by A. J. Legg, of Albion, W. Va.]

In presenting this subject to the Institute, I am aware that I speak of a subject that has not attracted much attention among many of our farmers. While all recognize the fact that the doctor, the lawyer, and any one following any of the various other professions, or any one following any of the mercantile pursuits require a special training in order to make a success of his chosen life work. It seems to be the prevailing opinion that the farmer needs no such training in order to insure success on the farm. If a man can plow, hoe corn, or use the ordinary farm tools, he is regarded as pretty well equipped for a farmer. The farm is regarded as the place for such persons as have not attained sufficient education to be able to follow some other pursuit in life. The children are often told in our public schools that they should be diligent in order to attain sufficient education to prepare themselves for some higher calling in life than manual labor. They are indirectly, if not directly, taught that manual labor is only intended for persons who have not attained sufficient education to follow some profession. They are led to think that it does not require much thought to make a success at farming. Nothing but hard work and plenty of it is required according to the popular notion.

It is true that the farmer could make a tolerably good living without so much thought and without any special training during the early settlement of this country, while the land was all new and no attention had to be paid to keeping up the fertility of the soil. In the earlier settlement of the country there was not so much expected of the farmer, the quality of the various farm products did not play such an important part. There was not such close competion and the farmer did not have to cater so much to the demands of the market. He could have attained greater success however if he had been better prepared for his work. As it is, we today have to pay the penalty for the ignorance of our fore-fathers by having a soil robbed of its natural fertility to cultivate. It is a case of the sins of our forefathers,-(ignorantly committed) being visited upon us. There was some excuse for our forefathers mismanagement and ignorance, however, as they did not even have the advantage of a primary education. The farmer today cannot claim the same excuse, as every one has the opportunity to obtain a reasonably good primary education by simply taking advantage of the opportunities afforded by the public schools.

The government has put an Experiment Station in each state which greatly aids the farmer who will avail himself of such help. We have agricultural colleges established in many of the states which afford opportunities for those who desire to take an extended course in agriculture.

There are several good agricultural reading courses prescribed for the benefit of farmers who cannot attend college. The State has gone to considerable expense to educate the farmers by means of farmers institutes held in each county. There are a number of good agricultural papers which can be had at a trifling cost, which will greatly aid the farmer who reads them.

It should be the ambition of every farmer to be able to leave his farm in a better condition, when he is called to his final reward, than it was when he found it. The man who dies debtor to the soil which supported him through life has made a failure at farming. He has left that part of the earth which was intrusted to his care in a worse condition than when he found it. He is an unprofitable servant. He is an unfaithful Steward.

## DOES SUCCESSFUL FARMING DEMAND A BROADER EDUCATION THAN ANY OTHER PROFESSION?

[Address delivered by S. L. McColloch before the Ohio County Farmers Institute, Elm Grove, Feb. 21, 1900.]

Agriculture was the first art, but probably not the first art reduced to a science. The art of Agriculture began with the ending of that lamentable act which occurred in the Garden of Eden. A woman was there, also an animal called a man. And to this day where one of the species is found, you may be sure that the other is not far away. There was also a third person present, but in disguise. Fate was also present in the form of temptation, and it fell to the lot of the woman to meet it. It was present in acceptable form by the third person present. The famous trio were called Adam, Eve and the devil. And although the convention had a disastrous ending, strange to relate, the parties thereto are evidently on the best of terms today, as we find the third party frequently entertained by the first two. You are acquainted with the result of that meeting. I for one, have never been able to accept the result with a great amount of equanimity, but have never cast as much blame upon the others, as I have upon that man Adam. If I had been in his shoes, I would never have let thai lone, lorn woman get far enough away from me to have seen a snake, let alone have time to talk to it. I certainly never blamed the devil, and not Eve, surely. And then to think of that man Adam's excuse; it was horrible. Why he would have yielded himself, had the devil offered him a seat in the legislature. But had the result of that meeting been any other than it was, there never would have been any call or cause for a discussion of the subject upon which the committee has called me to do duty. But probably it was all for the best, and I take pleasure in championing the great and growing cause of agriculture, and am firmly convinced of the righteousness of it, and hope to convince you that "Successful farming does demand a broader education than any other profession." If I were to ask you, as I have others, what is meant by successful farming, your answer would probably be the same as theirs, viz: The making and saving of money or its equivalent. But bear in mind that we are speaking of successful farming, and not of successful farmers. You must make a distinction between the two terms. Success is a relative term, and means the favorable or prosperous termination of anything attempted. Success depends upon the height of your ambition. What would be success to one might mean failure to another. But successful farming necessarily implies a successful farmer as a moving force behind and beneath the enterprise. Is the successful physician the one who accumulates the most money? When you choose your family doctor, do you select him by this standard? Certainly not, you employ the one who is most successful in the art of healing. You call upon the one, who taking the science of medicine as his guide, applies his knowledge to the art of healing in a manner by which the greatest amount of distress is relieved and the greatest number of the sick are made whole.

If you have a case at law and need a counsellor, do you choose the richest lawyer from out the number to counsel you and plead your cause? But rather do you not employ the one who in that special branch of practice in which your case appears, has carried the greatest number of cases in his keeping to a successful issue. By what standard do you rate the most successful minister of the gospel? By the amount of salary he commands, or by the number of witnesses who are able to testify that through his influence they have been led to accept Christ as their Savior. Then if such be the standard of success in these professions, why lower the standard as to the profession of agriculture and place it upon a plane where the sordid view of money getting and money saving predominates, and the degree of its success is measured by the size of the coffers of the practitioner thereof. No, such a view is too gross, too niggardly to take as the ultimate object of the broad and far reaching philanthropic influence of the great and grand profession of agriculture. Don't understand me as decrying the money part of the question, but money is only one of the fruits of success. Money gives you power and independence and is a potent factor among all the elements that go toward making farming a success. Yet it only possesses power when in use and cannot grow except when used. If you practice successful farming along the

Picture of a Registered Short Horn Cow belonging to E. W. Smith, Jr., Weston, W. Va.

lines which I shall lay down, money will be just as sure a fruit as any other assured by success. Each one of you can call to mind a farmer who has succeeded in amassing lands and money or both and yet you would not point him out as a man who had made farming a success.

Why? On account of his surroundings. His lands have deteriorated in quality. His buildings have fallen into decay. His fences are out of repair and briars and weeds cover his fields. I think that you will agree with me when I say that successful farming means the effect of causing one or more acres of land to produce the greatest possible amount of any desired product. What is the maximum amount? Who knows? Is it 40, 50, 100 and 200 bushels of corn per acre? Is it 1, 2, 3 or 4 tons of hay? Is it 100 or 500 bushels of potatoes per acre? These and greater amounts have been produced. Have you so succeeded? Successful farming is the making of two or more blades of grass grow where only one grew before. It is the constantly increasing fertility and productive quality of your lands without retrogression. Who of you accomplish this? Think again. What is required and demanded of the farmer who does this? You admit that the requirements are greater than you are able to meet. What are they? Greater knowledge of the laws of causes and effects. Then, you have hit the nail on the head. We must have greater and more varied knowledge. A broader education, covering to a greater or less extent a knowledge of every science and department thereof, the laws of which are at work under our feet, over our heads and in the atmosphere surrounding us. Our education should be broad enough that our five senses, seeing, hearing, feeling, smelling and tasting, should instinctively recognize, and our minds realize the workings and effects of the laws upon which our success wholly depends.

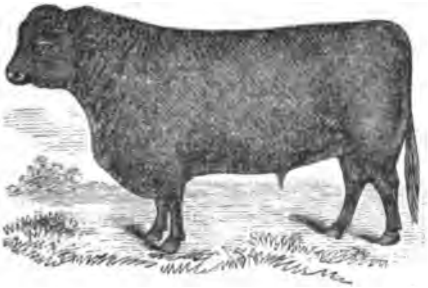
Can it be possible that our work can be intelligently performed under any other conditions? Can successful farming be obtained otherwise? Again, most people think that education consists wholly in the amount of knowledge one is possessed of. This is far from the truth.

Education does not imply so much the communication or reception of knowledge as it does the discipline of the intellect and establishment of principles. To educate means to train, to learn the *how* to learn.

### KNOWLEDGE COMES AFTER.

This thought will naturally suggest itself to our mind, that if there be pupils to be taught, there must be teachers to teach. And if the farmer is to be taught and trained in this broad education, he must have a teacher who must be possessed of at least the same amount of knowledge which he is called upon to impart. This is true, but he is taught by teachers, and not by a teacher. In connecting this thought with the subject under discussion, let us give a few minutes study to the profession of teaching and its requirements.

The primary education of the teacher is the same as that of any other individual, who lays claim to be what is commonly called educated. This is called the training, or caring how to learn. Such is the amount of education received by those who graduate from our colleges and universities. Hence, the ending of this course of training is called the commencement. The commencement of the time for acquiring real knowledge. With this training, whether received through a course at college or otherwise, the individual begins to prepare him or herself for the profession of teaching. What does he do? Does he take up the study of all the sciences, master them, and thus fit himself for the teaching of them? Should he undertake to do so, the end will be easily foretold. He would prove a failure. The span of one individual's life is too short by far to accomplish the undertaking. To make a success he will choose a certain science and its kindred branches and make a life's study of it. Only in this way can success be attained. What college or university would command attention, or attain a standing, which made its different chairs of professorships interchangeable? One professor filling one chair this year and another next, and so on, until he has taught from each. No; the teacher's calling is one of specialties. His education is one of depth rather than breadth. The profession does not demand a broad education. In order to teach any branch of science the teacher must thoroughly understand it; be so familiarly with it that he needs no text book before him in order to hear a class recite. You or I could do that much with such an aid.



A picture of one of W. O. Law & Sons' Registered Aberdeen Argus, Jane Lew, W. Va.

Specialties are the order of the day throughout all the professions. In medicine one makes a specialty of the affections of the eye and ear. Another that of the throat, while another treats pulmonary troubles alone. Another practices surgery exclusively, and so on throughout the list. In law, there is the counselor, then the one who makes a speclalty of chancery cases, and another, who is never heard outside of the criminal court. The demands of their professions are on the narrow gauge order. But in the farmer's case, in whatever specialty he must follow, the demands are the same, differing only in amounts. He depends upon the operations of the same laws, whether he makes a specialty of growing corn, wheat, gardening, fruit, or breeding animals, or all together. And these laws are the laws upon which every natural science is founded. The successful farmer's mind should be so trained. so educated, that when following his daily avocation, a question arises which he cannot answer satisfactorily, he instantly knows to what branch of science it belongs, and where the particular book upon the shelves of his library is placed, which will give him the desired information. Then, when such knowledge is thus practically applied, he will seldom forget it, and it becomes his own, just as much so as the first discoverer's. There is not, and never can be a patent on ideas. When the same farmer goes to his library to consult his books, does he find the same author's name in each of them! Would not that be a queer collection? Then why expect one teacher to teach all things? I make three divisions in farming, and these may be taught or learned as so many methods: 1. As an occupation. 2. As an art. 3. As a science.

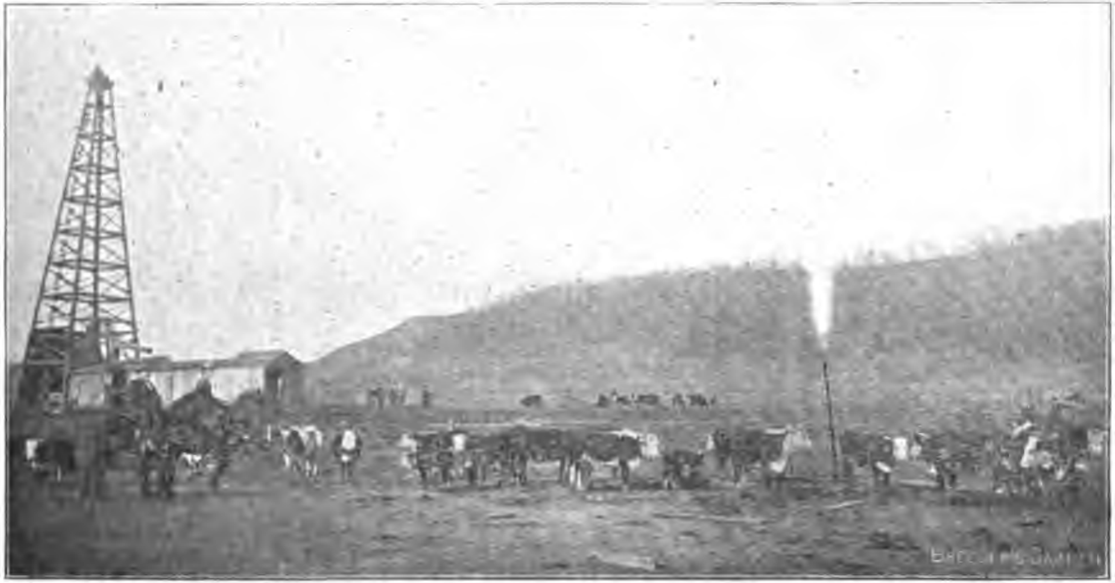
As an occupation it is limited to the imitation of certain operations. The following of the methods and practice of others, and when thus pursued it becomes a simple mechanical work.

It is frequently practiced in this manner, and does not necessarily require much education. The one who practices this method may not be able to read, write or cipher, and yet, like a sponge, may absorb enough practical knowledge to assist him in reaching the goal where his ambition rests satisfied. He may even be called successful.

2. As an art. Art is that which depends on practice and skill in performance. Art always throws itself into the form of rules, consequently the perfection of art will be the most apt and efficient system of rules. Art is the application of knowledge or power to practical purposes. Art cares nothing for knowledge, for itself alone, but only asks to be allowed to produce something. It cares nothing for the whys and wherefores, but only asks for rules by which it can produce something beautiful or useful, or both. A good, useful, well designed sled, may be just as good a work of art as a painting.

The first would come under the head of mechanic art. The second under that of fine art. The first is a product of the hands and body, the second is more of mind and imagination. The art of farming is a mechanic art. He who practices agriculture as an art always has some ideal object in view.

Principally that of the accumulation of riches, or it may be,



Scene on A. W. Woodford's Stock Farm, three miles below Weston, W. Va., showing his Hereford cattle warming themselves around the natural gas fire.

to just make a living. He practices the art under ideas received from others. He takes advantage of the results of investigation and experiment made by others without considering the reason upon which they are founded. He is a person of good judgment, readily selects and adopts new ideas and rules and is skillful in the application of them. Has good ideas of economy. Manages well, and is in fact, an ideal farmer. He reaches the height of his ambition, is content, and is called successful. He has made farming an art.

3. As a science. Science is literary knowledge, but more usually denotes a systematic and orderly arrangement of knowledge.

In other words, it is an investigation of truth. Science inquires for the sake of knowledge. Art for the sake of production. Strictly speaking, science has nothing to do with the practical application of its laws in the production of anything. A person may be a scientific farmer without producing a crop or an animal in a commercial way, and still be possessed of more agricultural knowledge than the one who practices it as an occupation or an art. A great many farmers call themselves practical, and take pride in the appellation. But they restrict the meaning of the term practical to the sense of useful, that is, being distinctive from the ideal or theoretical. All their labors are expended toward the end of reaping a reward in dollars and cents. This same practical farmer usually follows good and well known methods in the cultivation of the soil with success as to the end in view, but, with his successes he has his failures, and being only an imitator of others, he knows not how to remedy or provide against them, but repeats his operations in exactly the same manner and takes his chances. I give such a farmer a place under the division of art, and describe a strictly practical farmer as follows:

He is one who can perform the necessary mechanical work. He is one, who by practice, has acquired skill in the performance of his work, and who has collected and combined all the rules bearing upon his occupation into an efficient system. And in addition to this, he is one who has knowlendge to a greater or less degree of all sciences and departments thereof, which has a bearing upon everything with which the farmer comes into daily contact. In other words, everything which appeals to each and every one of his five senses. He is only a thoroughly practical farmer who thus practices the art.

I wish it distinctly understood, that when I speak of a farmer, I mean a partnership in which the man and woman are the one farmer. For, as success can not come against the will of the woman, successful farming can only be accomplished with her hearty co-operation and consent. She is often the whole thing. Success depends upon the partnership. For who ever heard of a bachelor being a success at anything. And as nine-tenths of the girls born and reared upon the farm are usually found in a receptive mood (at some time in their life) to discuss and consummate a partnership, I embrace them among those to whom a broad education is necessary in making farming a success.

Come with me and I will introduce you to a good neighbor of mine. We are good friends and esteen each other highly, though we differ to some extent in our ideas on many subjects. His ideas upon the subjects of farming, politics and religion are held without reason and he is encrusted within a shell of prejudice at least an inch in thickness, or I should rather say was. You might as well attempt to dam up the waters of Nile with bulrushes, or drain the ocean dry, as to undertake to convince a man of that kind he is wrong. He says that he is a practical farmer and has no use for book farming, that he has made a success of farming and had no education except what he got at the common school in his day (that was sixty or seventy years ago), and that more education than that spoils a man for farming. That it is extravagance to spend money for anything that can be done without. His buildings and fences are just about the same as when he inherited the farm. The use of paint is worse than extravagance, so none is seen either inside or outside his house. His land is probably no better nor worse than his father left it. He takes an agricultural paper but acknowledges that he don't read nearly all of it. When he comes across the words humus, ration or science, he drops that subject and seeks another. He also takes a church paper for his wife. He is a good farmer. Follows good methods and practices well known rotations in crops. Has good grades of stock of all kinds, and takes good care of them, for he well knows that it means money in his pocket. His success, as he calls it, means that he has bought and paid for another farm about the size of his home one. He also has money drawing interest. He has two sons and three daughters, one son at home, the other married, and living on the other farm, which he intends shall be his own when he dies. Two daughters are married, one at home. He says that he does not believe in giving his daughters as much as his sons, for when they marry it will be out of the family, and there is no telling what their husbands will do with it.

But he thinks that he will have two thousand dollars to leave each of them if he don't lose it. That was all he got with his wife. One incident happened about a year ago that will illustrate his idea of economy. After much coaxing, pleading and persuading on the part of mother and daughter he consented that the daughter might go to a boarding school. That was in September. In October he lost a horse. In November a cow died and the dogs killed a few sheep. To have seen him, you would have thought that there was nothing left to him worth living for. That he was a bankrupt. And as he had neither philosophy nor religion wherewith to console himself, he concluded to bring his daughter home from school. But for all this, he is a first-rate man and neighbor. After all the hammering I had done on that old shell of his no impression had been made up to this time, but as you will see further on, I did succeed at last in a measure.

One day last summer I invited my old friend to drive across the country in an adjoining county to visit a friend of mine, whom we will call Smith. He accepted, and one day after harvest we made the trip. I had acquainted friend Smith of the intended visit and the object in view, so we were received with hearty welcome and amid some general conversation were soon made to feel quite at home. Dinner was soon announced and my old friend made acquainted with each member of the family. He was soon talking with them from the oldest to the youngest. Had thrown off all reserve, and you would have thought that he had known them all his life.

The dishes of food were just such as his mother had made. The family was just as his own at that time of his life. He recalled all the pleasant memories of the time and was in the jolliest, best humor. It was his first visit outside his home neighborhood in years.

He looked and acted ten years younger than he realy was. He was just as I wished him to be. After dinner we were invited to inspect the farm and see if we could find anything to interest us. We passed out and across a well kept, closely shaven lawn, with its winding concrete walks. Here and there were beds of choice selections of flowers, arranged as to growth and coloring in a perfectly harmonious manner.

Several clusters of shrubbery were well placed, and the whole giving a pleasing effect to the eye and a most delicious sense to the olfactories, so much so, that it drew the remark from my old friend (unconsciously I think) that it was "the purtiest yard he ever seed." Yes I said, friend Smith must have given the subject of landscape gardening some study. And it also shows that some one has some knowledge of the science of botany and forestry. I heard the crushing sound of a contracting shell and noticed in that instant my old friend became suspicious.

From the lawn we stepped into the vegetable garden full of the finest and best selection of edibles you ever saw. No weeds were to be seen anywhere. How do you manage to keep it clear of weeds asked my old friend. The answer was, by careful attention in never allowing any to go to seed, and careful selection and preparation of the manure placed in it. It was quite a job at first, but now it is an eazy task. Well, said my old friend, at home it is a hard matter at times to find the vegetables for the weeds. It seems that just at the time the weeds need attention the corn and "taters" have to be attended to or we would never have anything to sell, and we would never make any money. Mother gives it about all the attention it gets. Why, this garden looks as if it had rained last night. It did not rain down our way. No, nor did it rain here. You see that pipe in the center of the garden? Yes. Well that is a water pipe. and I have enough hose to enable me to irrigate or water the garden from that one point. My! that is nice. Where do you get water? From the top of that hill, I will show you that directly. But don't it take lots of work to keep it looking that way? Yes. it takes work; probably a little more than it would if the same amount of land were in corn or potatoes, but there is three times the amount of profit in it as you see it, as there would be if planted to corn or potatoes. And again, under the system I plan and work this is a part of the farm and must receive its share of attention. From the vegetable garden we passed into a garden containing small fruits, table corn, potatoes, &c., so arranged as to space and place, that horse cultivation was practicable. Here everything was in the thriftiest condition possible, showing the highest cultivation and evidencing the value of irrigation. From here we passed through the apiary grounds, where we found at least fifty hives of bees, all busy gathering and storing the rich honey from sources far and near. Now we are in the orchard containing apple, pear, peach, quince and other trees, some full of the choicest specimens belonging to their kind, others bare, their fruits having been gathered and marketed in their season. My old friend remarked their shapliness, their bright colored twigs, the absence of dead limbs, and the particular care evident on every hand, and asked how it had been accomplished. Friend Smith answered, That in order to accomplish any piece of work in an intelligent manner you must have a reason for every step you take in performing it. In the vegetable garden you saw many different varities of vegetables. In their native country they grew and propagated their kind under almost as many different conditions as there are kinds. Some are native of the tropical countries; some were found in the temperate zone, and a few were even brought from the frigid zone. Every climate has plants particularly adapted to it. They are found at different altitudes from the sea level. Some plants flourish only in a dry, and some only in a humid atmosphere. The chemical constitution of the soil determines to some extent the character of the plant. Certain plants are almost exclusively found growing where certain kinds of rock prevail, thus establishing a relation between botany and geology. The physical properties of the soil has much to do with the kind of plants suitable to it. If you will examine the roots of plants you will find a great difference in them. Some have fine fibrous roots which must have light friable soils in which to revel. Others have heavy coarse roots, which like a heavy soil, &c. Some were found growing in dry exposed places, others where moisture and shade predominated. Thus you see that when we gather and grow the different kinds, in as small a space as my garden and under the same natural conditions, we circumscribe their natural geographical limits, and must in order to insure the greatest success in their growth, establish to a greater or less extent, artificial conditions to meet their requirements. The general laws which govern life, prevail in plants as in animals. They have organs of nutrition and reproduction, and a system of circulation, and taking into consideration the close relation existing between the two kingdoms, you should have a knowledge of their structure and their functions of their parts. Their habits and habitations. In this knowledge we have the science of botany, vegetable physiology, geology, minerology, chemistry, and all other natural sciences.

Chemistry also enters largely into the successful management of orchards, and here as elsewhere a knowledge of the science of entomology is demanded. This means knowing which insects are friendly or unfriendly to the farmer's interest, and which shall be preserved and which destroyed. Chemical combined with mechanical knowledge will assist you in destroying your enemies. You see I cultivate the bee. A most valuable assistant in the fruit culture, for it is largely through its agency that proper fertilization of fruits and flowering plants is accomplished. It is a money maker in its own particular industry. And to be successful in the practical art of bee culture, the science upon which it is founded must be thoroughly understood. Each tree, according to its kind, has certain habits as to growth, seasons and production; and these habits vary as to varieties of the same kind. Hence a knowledge of proper pruning and training is required. Again in the cultivation of gardens, orchards and field crops, we have great and good friends and able assistants in the different kinds of birds; so to know them we must have some knowledge of the science of ornithology.

In the vegetable as in the animal kingdom, kifferent kinds have their affinities for and dislikes of each other. Hence a succession or rotation of crops is established, varying as to soil, location, exposures, etc. And here you must know something of the sciences of geology, chemistry, climatology and meterology. Some vegetables and fruits must be widely separated, for they, like some people, become so friendly, that they forget their particular parts in the performance, and in talking over the back fence fail to complete their designed task. On the other hand a certain unfriendliness obtains between others, that close proximity deters them from reaching an approximate degr eeof maturity. Yes, said my old friend, I would not plant pumpkins and melons close together. He had been an attentive listener all the while, and would occasionally cast an eye in my direction, but made no remark. I imagined his thoughts. We then wended our way toward the fields, passing through the barnyard. The buildings had been located and built after carefully laid plans. The yard and roadway leading thereto was constructed with good grades, and carefully crowned so that no water could lie at any point. The drains were made branching in different directions, so that no great amount of water could accumulate at any one point. and the whole nicely McAdamized. My old friend stopped and took it all in in its entirety. I then said to Smith, I see that you have given the subject of civil engineering some study. ·Yes, said he, I have an excellent work in my library on the subject, and find it very interesting. Here he excused himself for a moment, and when gone, my old friend remarked that he found him civil enough but could see nothing for him to engineer, but after some talk said that he would have fixed it that way himself. Upon an inspection of the barn, stable, work shop and other buildings, we found that they had been planned and built after the best rules laid down by architectural science, at the same time all bad effects from use, carefully guarded against by following rules promulgated by the science of hygiene and sanitary regulations.

The work shop gave evidence, that while he might not be a master, yet he had a considerable amount of knowledge relating to the different trades, the skill of which was necessary in constructing the buildings. Such as masonry, carpentering and smithing. He also gave us a talk upon painting as a preservative and painting as an art. This is what my old friend had called worse than extravagance. His live stock was of the best and most improved breeds. fitted for their special purposes. Here we had a most interesting talk upon their anatomy, physiology and the science of breeding. The most of this knowledge is embraced in the science of zoology, which treats of the classification, structure, habits and habitations of animals.

The turf of his pastures was thick and springy to the step, and my old friend, upon thrusting his cane through it into the rich mold beneath, remarked: "My! What 'tatters' that would grow." His growing crops and stubble fields gave evidence of careful preparation of the soil, and good cultivation. In walking along a level roadway (covered with a thick sod) extending from the barnyard to the extreme rear of the farm, my old friend's curiosity got the best of him, and he asked how it came to be there and for what purpose. "Yes," said friend Smith, "that is something I promised to tell you about. It is a roadway used in hauling from the field to the barn. We pull the load onto it at the earliest possible moment, thereby relieving the team of extra labor, and also we save the unnecessary strain, wear and tear upon the wagon in hauling upon a hillside. You will notice that it is constructed on a level, with a ditch on the upper side. At regular intervals along its course there are tile openings under its bed, leading from the ditch to its lower side. On the hill I have constructed a basin. From the front to the rear of the farm there are a number of springs. At one place I have led three of these springs to one point, at another two, and at another three. This I do by means of pipe and ditches. At each one of these points I have placed a hydraulic ram, by means of which all the water is forced into the basin on top of the hill, from whence it is led to points where I wish to irrigate. By allowing the waters, whether from the basin or from rains, to flow into the ditch on the upper side of the roadway, I can distribute it as I wish over the land below. This saves it from gathering at any one point and making ruts." The effect of the irrigation was very noticeable. My old friend allowed that if the cost was not too great that it would pay all right. "Well," says Smith, "it makes me in a measure independent of the weather, and I have found it to be a paying investment. I use the water throughout the house, dairy, barn and stable, garden and lawn, and also make it serve me as a power, by running it through water motors. Any excess is turned back into the rams to be used over again."

"Well," says I, "in inaugurating this system you necessarily had to have some knowledge of mensuration and surveying, be acquainted with the laws relating to hydraulics and hydrostatics, and many other laws of natural philosophy."

"Well," says my old friend, "I reckon I know enough to know that water will run down hill." "Yes," says I, "but do you know how to make it run up hill?" "Well," says he, "if I don't I guess I have the money that will make it do so." All this time he was evincing the keenest interest in everything seen and explained, and between this swelling with curiosity and expanding with geniality, I heard at intervals the shell flakes dropping by twos and multiples, and I said to myself, old fellow, I am going to have you fixed all right yet. By this time we were at the boundary line of the farm, and my old friend kept glancing from one field to the other which lay upon either side of the fence. My! what a difference in the soil in these two fields, he said. That over there looks sour and does not grow anything of value. If I had it I would lime it.

What would you do that for? I said. Why, to sweeten it, he replied. How do you know that it is sour? Well, it looks like it. And how do you know that lime will sweeten it? I have tried it, he answered. Besides, lime is a good manure. How do you know all that? I asked. Well, I read it in a paper. O ho! been book farming, eh? No sir, I said I had read it in a paper, didn't see it in a book at all. Well, says I, that soil over there may be sour, but lime is no account as a manure. Hump! says he, he thinks that I don't know much about farming. So he appealed to friend Smith for information. So he answered that the fertility of all soils depends largely upon the amount of humus present. Humus! what is that? asked my old friend. I have seen that word before, but whenever I came across it and all those other big words you have used to-day, I just quit reading. Humus is decayed animal or vegetable matter. Elementary soils are much the same, but some are made richer by this matter called humus than others. It is readily washed from the soil by rain. So you note the difference between soils protected by grass, growing crops, leaves, etc., and that exposed to the elements without such protection.

In heavy, wet soils it does not accumulate to any great extent and is destroyed by the action of the water. This field, when I commenced to cultivate it, was just like that one over there. The soil was sour. How did you find that out? asked my old friend. There is one simple test that will tell you. Get a piece of litmus paper. Take some of the soil, make it wet and place a piece of the litmus paper in it. If it is sour (or acid) the paper will turn a red color, and according to the degree of redness of the paper, the degree of acidity in the soil will be approximately told. How much does that paper cost and where do you get it? asked my old friend. You can get it at a drug store, and a quarter's worth will make several tests. Well, I am going to get some, but is not lime all right on such soil? Yes, that is what it needs, but its greatest function is a chemical one in changing the acidity, and it has very little, if any, manurial value. I underdrained, limed and manured this field, with the result you see. Who owns that over there, and why does he not do as you have done? William Cameron is the owner. What! Bill Cameron, exclaimed my old friend. Why, he is the richest man in the county, is he not? Yes, he is said to be, and I will give a short account of his life and it may be you will find an answer to the latter part of your question.

I have known him from my earliest youth. His boys were my playmates. His father owned a considerable amount of land, and he being an only child inherited his all. He had a common school education. He married a bright, vivacious, well educated young woman, a daughter of a clergyman. Every one said that it was a good mating. In the course of time five children were born to them. He had inherited a greed for land from his father, and ten years after marriage little was seen of him or his family. His wife had settled down into a monotonous routine of drudgery; every cent was saved to put into more land. The children did not have the same liberties as their neighbors. Repairs were kept up, but no improvements were made. There never was a gallon of paint used on the premises. The mother did the best she could by the children, but when John, the oldest boy, was sixteen years of age, he wanted his father to let him go away to college. But *no*, he was in debt, and could not afford the expense. John concluded to go out into the world and make his own fortune and met with little opposition from either parent. He claimed a horse as his own, and his father bought it for one hundred dollars, and thought it was a magnanimous act, as he said it was only worth seventy-five.

Each of the boys did the same in their turn. The two daughters remaining and there to this day they and their mother still laboring to pay for more land. The oldest boy became a lawyer, and is now a member of Congress. The second is a clergyman and has charge of a congregation in an eastern city. The third one is a successful practitioner of medicine. They are frequent visitors at the old homestead, and a prouder father of sons is not to be found anywhere. You would think from the why he talks and acts that he is to be credited with all their success. And I verily believe, from what I have heard him say, that when he dies the boys will inherit the bulk of his fortune to the almost exclusion of his daughters. What! No, no! spoke up my old friend, he would not be that mean, would he? As he spoke I heard a clinking noise on the ground, and, looking down saw several pices of shell. But it is getting late and we must be off for home. In returning to the house he showed us the internal arrangements of it, and on every hand there were evidences that the science of economics had been thoroughly mastered.

This is the science of household affairs. His library consisted of at least one hundred volumes, bearing upon every subject connected with successful farming, with liberal additions covering literature in general. On the way home not much was said, but I saw that there was a considerable amount of thinking being done Occasionally, my old friend would drop a remark more in a soliloquising way than otherwise, somewhat to this effect:

"I wonder-what-all-them-books-cost." Probably two hundred dollars, I answered. That is a big lot of money, he said, but—I—don't—know. Again? say do you think that old Bill Cameron will do that? Well, now, everything was nice, and it looks as if he did make some money. What a nice lot of bright, intelligent children they have. That curly headed boy talked as if he knew as much as his pap. And that woman of his, why a person could not help loving her. It seems as if I had known them all my life. I would like to have them come down and see me. But I guess that I will have to fix up a little first. All along the way I could hear the rattling of shell on the pike, and when I let him out of the buggy he stepped so lightly that I thought he must have gotten rid of all the old shell, but as he turned from me, I saw a broad streak down his back all covered with moss, and I said to myself, he will be buried with that. Coroborative to the above, is the fact, that the cause of agriculture is of the first and main importance to the life and wealth of the nation. It is the basis of all wealth. It feeds and clothes the world. Its great importance has always been recognized by civilized nations by the fostering care and aid given it by them.

This has been the case all through the century about to close. Our government has given its department added dignity by elevating it to the rank of a place in the President's cabinet. It is the only one distinct science that has attained this distinction. By this recognizing your profession as of the first importance, your government concedes that the demand of the times require an education broad and far-reaching in its scope, and offers you individually the results of its investigations free. Nay, more, by instituting experiment stations in the States of the Union at your very doors, it literally goes out into the highways and compels an acknowledgment of its efforts to benefit you and your chosen profession. What other profession, what other calling is thus given such advantages. None. Do you appreciate it? Do you avail yourself of the time and opportunities whereby you may add to your wealth by the mere taking.

If it were money, filthy, dirty paper, with green backs, you would never question the channels through which it may have circulated or think whether it were reeking with the bacteria of smallpox or tuberculosis. But how eagerly you would grasp it though death lurked within its fibres. But in spite of this fostering governmental care, this free aid to you and your generation, there are some to be found among you, who rail in invective against it, who decry the methods and means whereby it is accomplished and even deny its usefulness.

But let them rail, laugh and decry. Their prating and ranting is as the crackling of thorns under the pot. The car of progress stops for none such. It may be retarded thereby to some extent for the force of example is great. But if by no other means, the old man with his scythe will eventually clear the way. Among all the professions there is no pursuit in which so many of the laws of nature must be consulted and understood, as in the cultivation of the soil, and as all of the natural sciences are based and founded upon these laws, they enter into, to a greater or less extent, all farm operations. Even that little known, but that great and mighty force which Franklin drew from the sky and harnessed, will be used as a helpful adjunct on the farm. Among the many departments of knowledge called sciences, which time will not permit me to use in practical application in the presentation of this subject, are those of book-keeping, political economy, dairying, poultry, rational feeding, management of stock, &c., and so on. A large portion of all knowledge necessary for successful farming may be found in the study of the science of Biology, which means the study of life. The study of all living things. The study of the form and structure of all plant and animal organism. Their anatomy and the work of their organism, their physiology.

It means knowledge of the great and distinctive battle being waged between the lowest organism of the plant world called bacteria, and the highest organism of the animal world, called Man. Biological knowledge is giving us new fruits and new grains. It has placed the Art of Agriculture where man performed—but without reason—on the sure foundation of science.

And, in the grand old Ship of State, is found agriculture as an art; at the wheel, with agriculture as a science, on the bridge, commanding and directing, with all the other sciences as a helpful crew. Her cabins are filled with the members of the agricultural profession. She is carrying food and clothing to the whole world, and returning with trophies and wealth to lay at the feet of a grateful nation. But, do you ask, where are the other professions? They are the barnacles upon her hull.

This concludes my report. I have endeavored to give you an outline of my work as best I could, under the circumstances. As my space is limited, I am compelled to condense accordingly. Thanking you one and all for your kind assistance in the past year, and craving your encouragement for the coming year.

I remain,
Yours most respectfully,
D. M. SULLIVAN,
Institute Director.

# REPORT OF VETERINARIANS.

WHEELING, W. VA., Sept. 11, 1900.

*To the Hon. J. B. Garvin, Secretary of the State Board of Agriculture, Charleston, W. Va.:*

DEAR SIR:—All organizations and institutions originate in some man's mind, after which, if they ever amount to anything, they pass through an experimental stage and finally become an established fact. The State Board of Agriculture of the State of West Virginia has passed all the doubtful stages and has become so fully established that it is without doubt here to stay. The work accomplished by the Board in the past has been variable and far-reaching, and has been fully appreciated by the farming community through the State. I have the honor to report to you the work that I have done in connection with this Board. Like all my past reports, I can say that many questions have been answered direct to the stock owner; some of which have reached the columns of the Farm Review, a reference to which may be had to show the nature of this part of the work. I do not know the number of letters answered, but there were a great many, and they seem to have been satisfactory, as the number is constantly increasing.

In closing my last report I had occasion to refer to an outbreak of glanders in the oil fields at New Martinsville. That report was not complete, as the danger was not past at that time; but now I can say that the workings of the State Board of Agriculture in stopping the spread of the disease and effectually stamping it out was something not to be ashamed of. There were probably as many as one hundred horses that succumbed to the disease, and so far as I can learn not a single animal contracted the disease after the work was taken charge of by the Board of Agriculture, unless two cases of glanders that were examined, condemned and destroyed at Proctor recently could be said to have received the contagion from the other field. This may or may not be true, as we were unable to trace the contagion in the latter cases positively. However, we were called upon recently to examine two horses at Proctor, with the result as outlined above. I also had occasion to condemn and destroy one horse affected with glanders at Parkersburg. That case could not be traced to any other source of contagion. It seems that it would be useless to record here the steps taken in eradicating the disease, as in all probability the Board will be able to cope with such cases in the future as well as it has in the past. The cost to the State was very slight, considering the gravity of the situation. At New Martinsville the disease had existed for fully six months, during which time no less than fifty valuable animals were stricken down with the disease, and it was spreading rapidly when taken in charge by the Board of Agriculture. This, with the number destroyed by the Board, makes up the number lost as mentioned above. The work of the Board was accomplished inside of the space of fifty days, and all expenses incurred for work by the Board, as well as paying for the animals destroyed, came short of $1000. This the Board of Agriculture can at any time refer to as proof of their usefulness without shame or regret. During the period covered by this report there has been very few cases of tuberculosis reported to the Board. This, however, does not indicate that we are by any means free from the disease. Tuberculosis is a disease of slow progress, and only when it gets a good hold of a herd is it apt to come to the attention of the Board, and not until the stock owners come to realize more fully that the Board of Agriculture is working for their interest will we get at work right to eradicate this and other contagious diseases peculiar to animals. A law governing the importation of animals into our State would in a great measure reduce the loss from contagious diseases. Other States have laws governing such importation of animals, and we without such a law become a veritable dumping ground from all surrounding States. Such a law will be presented to our next Legislature, and we hope will be favorably acted upon.

Several cases of rabies have been reported although none have come directly under my supervision, but I wish to emphasize, as I have before, that a proper law regarding the keeping of dogs, rigidly enforced, would save many valuable animals as well as the lives of some of our people. A well trained dog is a valuable servant herding sheep or cattle, but this whole country is over-run by countless numbers of worthless curs which should be driven from the face of the earth. Every dog should be taxed and registered and the owner required to place a collar on the dog, to which should be attached a tag bearing the number of the register. Then there should be a bounty offered for all dogs destroyed that were not so registered. Also the owners should be held liable for all damages done by their dogs. I think that would cause a thinning out of the present number of dogs.

The only other notable feature in this line of work was the outbreak of a disease of the eyes in cattle (contagious conjunctivitis) at Ben Lomond during the month of June of the present year. There had been several isolated cases in that section but it finally reached a herd of fifty steers when the assistance of the Board of Agriculture was asked for. We found fully half of the herd affected, which continued to spread until nearly every one had had the disease. The herd and farm were quarantined and proper measures taken to stop the disease as well as to save the eyes of those affected. At present the herd is free from the disease and the quarantine lifted. The greatest loss in this herd was the stopping of the growth of the cattle while the disease continued. This disease (contagious conjunctivitis) is something new in our State, although it has been known by the Government authorities to exist in this country for the past two or three years, and with the assistance of the Chief of the Bureau of Animal Industry, at Washington, we were able to cope with it intelligently. There were also a few cattle affected with this disease at Milton, in Cabell County, which were cared for by the Board.

Of course there was the usual amount of distemper, influenza, milk fever and other diseases common in our domestic animals, but these were mostly treated by the owners or by vetenarians called in at the expense of the owners and do not come under the supervision of the Board. Let me say that the revision in the law governing the Board that was made in 1899 was a great assistance to us in carrying out our work, and we hope that the next Legislature will appreciate what has been done and will do what they can to support the Board in the future. So far there has been steady progress in the Veterinary Department of the Board and we hope that the cordial workings of this department may continue as it has been carried on in the past.

Respectfully submitted.
WM. PETRIE.
Consulting Veterinarian.

FAIRMONT, W. VA., Oct. 1, 1900.

*Hon. J. B. Garvin, Secretary of the State Board of Agriculture, Charleston, West Virginia:*

DEAR SIR:—In submitting to you my second bi-ennial report, I do so with less reluctancy than when I made my first report for the reason that during the past two years the work of the Consulting Veterinarians has greatly increased, and therefore they have more to report. This increase of work is due to several causes. The fact that a greater number of people are beginning to recognize what a Veterinary Surgeon is, and what use he can be to the owners of stock, especially when contagious diseases appear in their respective neighborhoods, when they can call upon one who can diagnose the case and use measures to prevent its spread. Then again, the correspondence of the

Consulting Veterinarian has increased. This is due to the fact of the farmers attending the Institutes, as it is there that many of them for the first time learn of the existence of such a person as a Veterinary Surgeon, and of his connection with the State Board of Agriculture, and that they have the privilege of writing him and getting the information which they desire through the columns of the Farm Review, without any charge. They, however, forget to enclose a fee of one dollar when advice is wanted, and they desire an immediate answer, and although the Board passed such a resolution and it has been published from time to time in the Farm Review, I would recommend that a copy of this resolution be printed at the head of the Veterinary Column in each issue of the Review, so that "all who run may read", and the Consulting Veterinarians get what is justly due them as they receive no salary except when actually employed in the service of the board. This part of the work at the best is very unsatisfactory as it is difficult enough to diagnose the ailments of our domestic animals when we can see them and observe the symptoms they present. We do not have the advantage of the physician who can ask his patient to describe to him his or her feelings, or whether he or she ever had a similar attack, or whether of a hereditary nature, etc., by learning of deaths in the family from the same disease. In a great many instances we are required to give diagnoses and treatment when the persons seeking the information can not correctly describe symptoms. Again, sometimes the symptoms described may fit a half dozen cases; and last and worst of all many times no symptoms are given at all. In cases like this I have come to the conclusion that some people think a Veterinary Surgeon is also a Fortune Teller, or that he has second sight. In some few letters of inquiry I have had excellent descriptions by observing people, in which cases it was a pleasure to give the advice sought.

I have also attended a number of Farmers' Institutes for which I receive no compensation, being paid only my actual expenses. As our State is naturally adapted to stock-raising and a number of farmers engaged in that particular work, they naturally seek and expect such information that will aid them in their particular line; so when I have attended these institutes I have been besieged with questions relating to the diseases of stock. I therefore recommend that at every Farmers' Institute one of the Consulting Veterinarians be instructed to attend and give such information as is desired, but some provisions should be made allowing him compensation for his time and trouble, not to say anything of his loss by reason of his absence from his practice.

As Chairman of your Committee appointed to draft a bill to be presented to the next Legislature, I beg to say that I will submit a copy of that bill for your approval. Finally, the most important work that the Veterinarians are called upon to do is to diagnose contagious diseases, for which the last legislature made provision. Although this provision was inadequate it was at least a beginning.

I shall, to make my report beneficial to those who may read it, give a full description of the diseases we have been requested to investigate, but before doing so I wish to make a few remarks not essential to the report but allied with it.

During the winter term at the West Virginia University, in the Agricultural Department, it was my place to give a three months' course in Veterinary Science—the first ever given in that College. This course is intended for the students attending the Agricultural College, not for the purpose of educating them for the profession, but that when they are back on the farm they may have a correct knowledge how to feed, how to breed, and lastly how to intelligently treat their stock, for some of the simpler diseases, and in some cases give temporary relief until the services of a competent Veterinarian can be had. This course will be repeated again this winter term, and an advanced course given all those who attended last year. Farmers and farmers' boys should make an effort to attend at least one year at the Agricultural College and it is better still to take the entire course.

Another matter to be taken up here is the breeding question. In my last report I sounded the key note, saying that our stockmen should breed to improve sires and dams. The market is improving day by day, and well-bred, good individuals are bringing good prices, which in fact are hard to get, and, as I said, at that time the farmer and not the buyer will set the price. In my own county of Marion this is already so. Formerly, when a buyer came to town, he was surrounded with farmers who had stock to sell, but this is changed, and the buyer, in a great number of instances, has had to hunt the farmers and ask them if they had stock for sale, and was a great deal more liberal than formerly when the farmer went to see the buyer. Therefore, if you raise stock, raise the *best*, and you will always find a purchaser at a liberal price. Right here let me add that great stress should be brought to bear upon the members of the next Legislature to make some provision to protect these live stock owners from loss from contagious diseases, by enacting such laws as will prevent the introduction of animals into this State which are suffering with contagious or infectious diseases, thereby infecting our own native herds. In order that some of these diseases may be recognized by the owners themselves, I shall describe the symptoms of the several cases I have been called on to investigate. This will also have a tendency to make the Biennial Report of the State Board of Agriculture eagerly sought after as a book of reference.

## RABIES.

It seems quite necessary to me that a full description of this disease should be given, in order that it may be recognized before the animals having it can do any damage. So many people have a wrong conception of this disease, and worse still, quite a number believe it does not exist at all. Quite a number of out-breaks have occurred within the State in the past few years, with considerable damage and loss of stock. I shall endeavor to describe the different forms and symptoms: This disease is of an acute, contagious character, originating in the carnivora or canine family. It must be produced by direct contagion, as it never occurs spontaneously. The specific virus is carried by the saliva and may be transmitted by a bite from the animal, the saliva coming in contact with an open wound, or direct inoculation. The period of incubation is the time between the inoculation and the appearance of the symptoms of the disease; which period in Rabies varies from five to one hundred and twenty days, although there are cases on record in which the period of incubation has been longer; one case in particular being four hundred and twenty days. Rabies is erroneously called Hydrophobia—which means "a fear of water." This, however, is not true. Rabid animals are not afraid of water, and frequently while on their path of destruction have swam across rivers, and while suffering from the disease made attempts to drink water, but on account of the paralysis of the throat, are unable to do so. This disease has been described by ancient writers. It has never appeared in the Frigid or the Torrid Zones, but is peculiar to the Temperate Zones. Sometimes we do not hear of a case for a long time and then have several outbreaks in different sections of the country. Some writers claim that it arises spontaneously, but on this subject there is great contrariety of opinion. We know it is propagated by contagion and inoculation, the influence of the seasons, food, hunger, thirst, domestication; extreme venerial desires do not produce the disease. Another opinion generally accepted by the people is that it is due to heat, "Dog Days," etc. Statistics prove that the disease is more prevalent between the months of January and June than any other time of the year. Another opinion is that it is less frequently seen in bitches than in males, but this is also wrong simply because there are fewer bitches than males and a dog will rarely ever bite a bitch. Otherwise, sex has no influence, because the bitches are just as susceptible to inoculation as the males. All animals inoculated do not develop the disease. The virus is negative after the animal is dead twenty-four hours. The saliva is the vehicle for the conveyance of the virus. The most common way of producing this disease is from the bite of the male, and slight wounds in which no hemorrhage takes place are the most dangerous, because the blood flowing from the wound may flush out the virus. Frequently rabid dogs bite people and sheep, but it is not certain that Rabies will follow in either instance; very often the saliva is wiped off the teeth when they have bitten through cloth or wool, thus preventing inoculation.

### SYMPTOMS.

The symptoms in the dog are of two forms: Violent or True; Sullen or Mute. There are few premonitory symptoms present, like in man, such as pain at seat of origin, injury or bite, melancholia, fever, stiffening about the neck and spine, although these have been observed in the dog by close observers. When the attack first makes its appearance after the incubative stage, the animal is restless and dull; it withdraws from its companions; avoids the light; hides in corners, acting in an unnatural manner. This stage of melancholia lasts but one or three days, then the other symptoms according to the form, violent or true, most dangerous, restless, lying down one minute and jumping up the next, excited in manner, looking at imaginary objects, change in voice, bark of dog or bellow of cattle; the change is very much marked in this stage. There is the tendency to bite and the inclination to wander, and it is at this time the dogs do the most damage. They will return home if not molested and still be able to recognize their masters, but a change in disposition is noticeable, some becoming very affectionate and others, which were formerly affectionate, becoming cross. At this stage of the disease it resembles insanity in man in its several different forms more than any other disease. There is a desire to bite cold objects, and very frequently this is a means of inoculation. A person having a slight wound on his hand, when caressing a rabid dog will allow him to lick his hand, and frequently this is the means of inoculation. Up to this time there has been no difficulty in swallowing and no intense thirst, and at no time during the disease is there any fear of water; but as the disease advances, paralysis of the muscles of the throat sets in and the poor animal is unable to swallow, and when the effort is made, owing to the construction and paralysis of the throat, it is unable to drink, which excites it to such an extent as to cause it to have convulsions or spasms not on account of fear but of inability to drink. Escape of stringy saliva at the time is well marked. Next we notice the animal is weak—loss of power and paralysis extending to the hind limbs; it will start to run and suddenly give way or will drag its hind legs; pupils dilated; optic nerve paralyzed; loss of power or retraction; even if light is held near eye, the pupil does not contract; paralysis of lower jaw now well marked; tongue protruding and of a dark liver color. It is in this stage that I have been frequently called to remove a supposed object from the animal's throat, and as they are yet able to close the mouth spasmodically there is danger of being bitten; (so my advice is be careful how you examine dogs for supposed object in throat). The eyes are sunken in their sockets, the lids of the eys reddened, the animal looks repulsive and emaciated; urine of a dark color with a strong odor; bowels constipated; appearance of other animals excite them; a sudden burning light excites them and each time they pass through the excitement they seem prostrated; strange tendency to eat unnatural objects, coal, stones, straw, glass, hair, cloth, etc., etc., and the finding of foreign substances in the stomach. Examination will verify diagnosis. A rabid dog travels a great distance, rushes at other dogs and animals, snaps and bites and goes on and does not stop, not even to have a pitched battle, but keeps on going. This disease is always fatal, animals usually lasting from five to seven days.

### SULLEN FORM.

Animals have no tendency to roam, but hide themselves. The virus is just as dangerous. Paralysis sets in earlier. Other symptoms present but not so well marked. In Marion County we have had quite a number of cases.

### CASE NO. 1.

A Mr. S. came to my office and asked me to prescribe for his dog. After giving me some of the symptoms I told him to go home and chain the dog until I could see him. On arriving at his home he found the dog had gone away. This dog, I am sure, is responsible for the loss of quite a number of cattle, and for the inoculation of other dogs. Mr. S., a month later, called me to see a two-year-old Jersey bull, which died from rabies.

### CASE NO. 2.

My next case was Mr. H., who had a cow that was seen when it was bitten by a dog whose home was fourteen miles away from Mr. H.'s place, and which was afterwards shot twenty-two miles from home. This cow developed rabies eleven days after she was bitten. Two calves that were wich the cow at the time when she was bitten, died from rabies, but there is no knowledge that they were bitten; so they must have been inoculated by the cow licking them, and they may have had some slight wounds, such as brier scratches.

### CASE NO. 3.

Mr. M. had a fine black mare which he had ridden to town on Saturday night, and on Monday morning was seen chasing calves around the lot. No knowledge of having been bitten was received, and the mare had been securely tied in a stable. Owner would not consent to having her killed. After suffering a great deal of agony and destroying the barn, she died. In this case I had a splendid opportunity of observing symptoms, but owing to an urgent call away from home, could not make a post-mortem.

### CASE NO. 4.

On Mr. T.'s farm four steers had died. When I was called to see another presenting same symptoms I found this animal had all the symptoms of rabies, well matured, and with the consent of the owner, shot him. The change in voice was very well marked in this case.

### CASE NO. 5.

Mrs. M. had lost four head of cattle, although I only saw one, and that one after death. I am convinced that she had rabies on her farm. She saw her dog when bitten and had him confined, and waited, and she kept a record of the symptoms of each one of her cattle and also of the dog.

In this same county, Lewis, I have had the reports of several horses which died with rabies. Also, several people were bitten. Some were sent to Pasteur Institute, New York, for treatment, and several deaths have occurred in the human family in this county. I tried to have stringent measures adopted to prevent further outbreak, but after receiving the promise from the President of the County Court, and the Mayor of Weston, my efforts proved useless as no action was taken.

### TUBERCULOSIS.

This disease is on the increase in this and several other States. In some few states, where radical measures have been adopted, they are controlling it. Unlike the disease rabies, which is only claiming a few victims each year, thousands and thousands die every year from this awful disease. It was claimed for many years by scientists that the disease is hereditary, but that theory has been exploded long ago. It is now considered contagious and is so acknowledged by our eminent physicians, but unfortunately our people have become so accustomed to deaths from this disease that little or no attention is given it. It is taken as a natural course of events; while, on the other hand, let a case of rabies appear in the neighborhood and the entire community is in an uproar. It were better that our people had the same fear of tuberculosis or consumption. Fear of rabies is instilled into the minds of our children from their very infancy, and this fear increases with years, especially should there happen to be a death from rabies in the neighborhood. While there is occasion for this fear as no remedy has ever been discovered for the cure of rabies, after the disease has developed, a preventive treatment has been discovered by Pasteur, of Paris, and quite a number of people who have been bitten by rabid animals have availed themselves of its benefits; and for those of an incredulous turn of mind I will cite an instance: Two men were bitten by the same dog which proved to have rabies, and were furnished the means to go to New York to the Pasteur Institute for treatment. Instead of going they spent the money so generously subscribed in having what they claimed, a good time, and returned home when their money was spent. One died with rabies within a week after returning; the other, after realizing thus his condition, returned to New York for treatment, and happily has not developed the disease. While he may never have developed it, although bitten by the same animal, the virus may have been wiped off by his clothing, yet the fact that it developed in the other individual may be one case that we can absolutely prove. That it did not develop in the man who received the Pasteur treatment, we can also prove. Yet, with all this statement, only a comparatively small number of people and animals die of rabies, and there is always very much emotion displayed when such a death occurs. While on the other hand, as stated before, thousands die of tuberculosis where one dies of rabies. Not much effort has been made to suppress the ravages of this fell destroyer until the last few years. That this disease is communicated from man to animals, and *vice versa*, is proven beyond a doubt; also from one animal to another.

### CASE NO. I.—MAN TO ANIMALS.

Under my recent observation a certain family repeatedly lost dogs from tuberculosis, which was traced to the fact that a member of the family having tuberculosis became carless and expectorated anywhere he happened to be when feeling the inclination. Dogs having the filthy habit of licking up the saliva containing the baccilli of tuberculosis in this way become affected with the disease, as did these dogs.

### CASE II.

A wealthy family; well known throughout the land, had a child die of tubercular meningitis. The diagnosis of the attending physician was doubted; the family clinging to the belief that tuberculosis was hereditary and claiming that consumption was foreign to them. The nurse was then examined and it was learned that she had been in the family for forty years—an unusual occurrence. The physician, not yet giving up, requested me to examine their cows, and I must confess that three finer specimens of the Jersey breed I have never yet seen. The first cost $800, the second $600, and the third $200. After using tuberculine test two responded, although judging from outward appearance they were the picture of health. The two higher-priced animals were condemned; the $200 cow did not show any alteraticn of temperature from the injection of tuberculine, but the family insisted upon her destruction also.

Cow No. 1, the $800 cow, upon post-mortem showed slight tubercular deposits in the intestines, but the udder had a large tubercular deposit, which had broken down and in the center was filled with pus; so that every drop of milk that was given by that cow was filtered through the tubercular abscess, conveying the baccilli of tuberculosis in its paths of destruction.

Cow No. 2—or the $600 cow—had tubercular deposits in the lungs and liver, while cow No. 3—$200 cow--showed no signs whatever on post mortem examination, which is another instance which demonstrates the value of tuberculine as a diagnostic agent.

## CASE NO. 3—FROM MAN TO ANIMALS.

A family that had lost several members from consumption had also lost several cows from same disease. Upon an investigation, I learned that the sputa or expectoration of these members, the emptying of the spittoon and other vessels, took place at the corner of a field in which the family cow was pastured, and I have no hesitancy in stating that these cows became infected with tuberculosis through this medium. Now, what is our remedy?

1st. To prevent the introduction of cattle having tuberculosis into the State, they must receive inspection and submit to the tuberculine test before they are allowed to mingle with our cattle, thus enabling us to weed out those which respond to the test. It has been claimed that the Tuberculine test is not infallible. True, but the per centage of failure is too small to belittle or underrate its benefits. I hope we will see the day that no dairyman is allowed to supply milk until his cattle have been tested with tuberculine, and his dairy has been placed under sanitary inspection. That the stamping out of tuberculosis is a gigantic task is not to be questioned, but as contagious pleura pneumonia was stamped out why not tuberculosis? This is only one instance in which disease is communicated from animal to man; there are many other cases, but these conditions are bringing the veterinarians and other physicians closer and closer together. In our large cities a veterinarian is considered of so much importance that he is frequently appointed on the board of health, or is employed by its members.

## SYMPTOMS OF TUBERCULOSIS IN CATTLE.

These are very difficult to descrite. On account of not being confined to one portion of the body, it is slow of progress and the animal may live for years. The disease is generally well established before any noticeable indications are seen, and different organs are affected. The only reliable method of determining is by the injection of tuberculine, which if the cattle have tuberculosis, is followed by a rise in temperature, in ten or twelve hours. This test is really the only real diagnostic agent, and while it is not infallible the percentage of failure, as I said before, is so small that this valuable agent cannot be thrown aside until we are able to get a better one. In chance cases there are febrile symptoms present; animals cough, loss of flesh, general unthrifty appearance, even with years of experience it is difficult to diagnose a case of tuberculosis except one that is badly affected. Glands of the throat may only be involved, or we may have tubercular deposits in intestines and viscera: breathing is hurried; temperature regular from 102 to 107; digestive troubles at the same time, are some of the first indications that tuberculosis exists. Failure to breed is common in cows having tuberculosis. There are three methods to detect this disease, even when the physical signs fail to reveal its presence, or the general conditions would not lead us to suspect it. First, examination of the secretions by microscope. This is impracticable on account of expense of test and the inability of ordinary farmers, stock-holders, etc., to use and understand management of preparation of slides.

Second:—Inoculating smaller animals and producing the disease. This method is unsatisfactory, on account of uncertainty and is a loss of time except for scientific purposes.

Third:—The best method for the detection of the disease is the injection of an agent called "Tuberculine". This is a mineral both practical and available, test easy of operation, and every stockman should make himself familiar with the method of applying it. In making examination for tuberculosis, first, ascertain history, breeding, general appearance, physical condition and temperature. Second, inject tuberculine hypodermically. Third, determination of temperature at certain periods after the injection of tuberculine has taken place. Fourth, note difference between temperature taken before the injection and after. To make this test properly it is necessary to have a clinical thermometer to take the temperatnre. Second, a hyperdermic syringe for the injection of the tuberculine. Third, tuberculine is manufactured by different firms and differs mostly in the diluent used. The tuberculine prepared by the Department of Agriculture at Washington, is diluted with glycerine and is injected in doses of two cubic centimetres equal to about thirty-two drops. Great care must be taken to have everything absolutlely clean. Skin should be cleaned with soap and water and carbolic acid. Instruments should be sterilized—that is, should be boiled. When test is to be made cattle should be carefully handled, not excited, then proceed without any marked change in the manner of feeding or caring for the stock. Milking should go on just as usual. As to the time of making test it is best to take temperature about 4 P. M., and again at 5 or 6 P. M. About 7 inject tuberculine and from 8 to 10 hours afterward begin to take temperature. The detection of the existence of tuberculosis depends upon the character and elevation of temperature within the given limit of time. In some states where the inspection of cattle is carried on, for the purpose of eliminating from the herd the cattle infected, the elevation of one degree is sufficient to cause the cattle to be condemned. In this State the inpection of cattle is only carried out upon the request of owner or when reported by the Veterinarians of the board, and until a systematic method is employed we can never expect to get rid of this disease in this State or any other, and for this reason more stringent means should be adopted and restrictions placed upon shipping.

Another contagious disease has made its appearance within this State in the past year. Specific Ophthalum, or Contagious Catarrhal Conjunctivitis. In Taylor, Barbour and Lewis counties this disease has made its appearance with the result that numerous cattle have become blind. From the information I have been able to get, this disease was introduced into this locality by a car load of young cattle brought here from Canada, and the result was that the native cattle became afflicted and in many cases became permanently blind. In some few cases recoveries were reported after a great deal of care and treatment, and fortunately all the cases except a few, were in young, yearling stock. While the loss was great enough, imagine the result had this disease spread to the fat cattle ready for market! Further investigation will have to be made before much information can be given to the public. I intend later on to write an article on this disease for the Farm Review.

## BLACK LEG.

Black Leg exists in certain portions of the State, but it has been in districts too remote for me to go; therefore I expect my colleagues who have had charge to make report.

The inoculation for the prevention of this disease should be practiced, as an "ounce of prevention is worth a pound of cure". This work should be taken up properly. If the instruction which is given to the agricultural student at Morgantown will only result in the practice of inoculating cattle in their respective neighborhoods, no calculation as to the value of the knowledge thus obtained can be made, not to say anything of the advantage of the farmers in their neighborhoods, and the amount of money and live stock saved by this means of procedure. Other diseases besides the contagious diseases have been encountered in our cattle. The dairyman's greatest loss is from Parturient Apoplexy—or Milk Fever.

Although this disease is of frequent occurrence, especially in the family cow, it is prevalent in dairy herds. If preventive treatment were adopted I think there would not be so many deaths. Neglecting to milk a few days before the cow is fresh is in my opinion the most frequent cause of this disease, and the milk undergoing changes acts as a poison to the system. Then the treatment which has given good results, viz: Injecting iodide of potash in the udder, almost makes it conclusive that it is due to some change in the milk secretion, or its changed condition after it is secreted, and failure to remove. Therefore if you want to prevent Parturient Apoplexy, or Milk Fever, milk frequently before calving and never allow the milk to accumulate, and thus you will keep the system in perfect normal condition, and I think the death rate will be very materially lessened.

So far this report has dealt entirely with cattle, but our horses have also required the attention of the Consulting Veterinarians, during the past two years. Glanders has been found in several counties, and it is only through good fortune that we had no more cases than we have had, on account of the unsanitary surroundings in coal fields and coal mines, where these horses and mules are worked hard and do not receive the proper attention. It is only by the prompt recognition of the disease where it has existed that this dreadful malady has been prevented from spreading. The people themselves fear the spread of this disease amongst their stock as well as the infection to the human race, and this fear has a tendency to hold it in check.

## INFLUENZA—OR PINK EYE.

This disease has appeared among our horses in the form of an epidemic for the past six months, and has been general all over the State. It has, as a rule, been in a mild form and very few deaths have occurred directly from it, although when neglected it becomes complicated with other diseases and conditions, and results fatally.

In making this report I have endeavored to submit only the conditions coming directly under my notice.

Respectfully submitted,
FREDERICK P. RUHL,
Consulting Veterinarian.

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KEYSER, W. VA., Oct. 1, 1900.

*Hon. J. B. Garvin, Secretary State Board Agriculture, Charleston, West Virginia:*

DEAR SIR:—It affords me much pleasure to transmit to you this my first report since my appointment as one of the Consulting Veterinarians on the State Board of Agriculture, in October, 1899.

I have answered but few inquiries, as we have had no special outbreak of any kind in this part of the State. Quite a number of calves from eight to fourteen months old have died of black-leg, or black quarter, near this place. I am safe in saying that $250 could not replace them. This loss has happened within a radius of thirty miles of Keyser. I was called to the Alkire Brothers Farm, near Keyser, on December 28th, 1899, where they had an outbreak in their herd of twenty-six head of high-grade shorthorns, ranging in age from six to eleven months; two of them having already died the night before and three more dying before we could procure the vaccine with which to vaccinate the herd. After vaccinating we only lost one. Mr. J. M. Knapp, of Bungers, West Virginia, wrote me through your honorable President, S. W. Atkinson, to send him enough vaccine for seventeen head, which I did at once, and he reported favorable results. The vaccine which I used I obtained from the Bureau of Animal Industry, Washington, D. C.

I attended several Farmers' Institutes and delivered short talks on contagious diseases among domestic animals and of man's susceptibility to same. I am glad to say our farmers and stockmen are awaking to the needs of legislation in order to check and eliminate from our State the contagious and infectious diseases which trouble us so greatly.

We have had a great deal of actinomycocis or lump-jaw to contend with. I, with my worthy brother Consulting Veterinarians, Drs. F. P. Ruhl and William Petrie, met in June at Dr. Ruhl's office in Fairmont, and drafted a bill which I think would be a great help to the State Board of Agriculture, if such a law or one similar could be passed by our next Legislature, and I trust it may meet with the hearty approval of the Board. It would very materially aid us in checking and keeping at bay all the contagious diseases which find entrance into our State.

Arnold Brothers, of Ridgeville, lost one steer with blag-leg. I was called to this grazing farm on the Allegheny in May to do some spaying, and when I arrived I was just a little too late, as one steer had died a few hours before. I held a post-mortem and found that death was due to black-leg—vaccile. I quarantined the farm and ordered vaccine with which to vaccinate the entire herd, but owing to the fact that the proprietors were at the time so busy with other work, I did not succeed in having them vaccinated, but there were no other deaths. I removed the quarantine in three months. Mr. D. Arnold, senior member of the firm, told me they had procured the vaccine and vaccinated the herd themselves on September 1st, and that the cattle were all doing well. I would add that to vaccinate, as a curative agent, the medicinal properties of the vaccine cannot be relied upon; but to vaccinate as a preventative has reduced the mortality almost to a minimum.

As I bring my first report to a close, I would say that my services are always at the command of the Board, and any advice I can give to this most honorable body, or to the farmers or stockmen through the columns of the Farm Review, you will find me ready to give at all times, as I am much interested in the subject.

Respectfully submitted,
S. E. HERSHEY,
Consulting Veterinarian.

# BOVINE TUBERCULOSIS.

BY CLARENCE SYMNS, KARN, W. VA.

"The history of medicine informs us that Hippocrates described many of the symptoms and lesions of tuberculosis in animals and man about 400 B. C. It was also described by Aristotle 330 B. C. and by Galen 180 A. D.

During the middle ages tuberculosis in animals was considered contagious, and the flesh of infected carcasses was condemned by law as unfit for human food. Many of these old laws are still in force in Italy and Spain.

During the first eight decades of the present century the common and accepted theory was that tuberculosis was hereditary—this was considered its chief, and possibly the only method by which it could be transmitted."

It may be said that the history of tuberculosis has been checkered by numerous theories which have been advanced, because the exciting or essential cause remained unknown until 1882, when Robert Koch discovered the baccillus tuberculosis. It was Koch's aim to determine the character of the contagious matter which, by previous experiments, had proved to be capable of indefinite transfer and reproduction. He examined the diseased organs of man and the lower animals microscopically and found the tubercles infested with a minute rod-like parasite, which he called baccilus tuberculosis. These parasites varied from 1-2500 to 1-10000 of an inch in length, and about 1-10 as broad as long.

These bacilli were separated and cultivated on specially prepared blood-serum; this continued for more than six months in some cases. These purified bacilli were then inoculated into healthy animals of various species and in every case there was a multiplication of the parasite and a reproduction of the original disease. Since that time the greatest activity has prevailed in examination, and with new and improved methods. The conclusions of Koch have been tested and verified many times, till the facts are now placed beyond all doubt.

This micro-organism is a bacterium belonging to an order of fungi. Fungi are plants which are destitute of chlorophyll, and hence cannot live on inorganic matter, as ordinary plants can, but depend wholly for their sustenance on matter already organized, by other living things, plants or animals. Another characteristic of these low organisms is that they grow in the absence of sunlight; indeed, in most cases, sunlight is absolutely injurious to them, so much so that a very short exposure will usually destroy them.

When placed in a suitable medium the tubercle bacillus grows and multiplies by a process of simple division. A single cell will grow and divide in the middle and two new cells is the result. This process goes on rapidly and indefinitely, as long as suitable food supply is present. The tissues of the animal body are the most favorable for the growth of this germ. The tubercle bacillus is a true parasite. So far as is known it can grow and multiply only in a living animal body. Outside of the animal body it can retain its vitality for a certain time, and when again introduced into the animal body it will grow and multiply. Parasites of this kind which depend entirely on the animal body for their growth and development, are known as true or obligate parasites. The discovery that the tubercle bacillus is a true parasite is of vast importance, because it means that tuberculosis can be wiped out of existence if the sacrifice necessary to bring about the proper conditions are made.

Then why should we permit this great waste of life to continue, when the disease is entirely preventable?

Why should it be allowed to continue on unchecked, destroying the lives of thousands and thousands of human beings and animals each year?

The disease is slow in its progress and uncertain in its immediate effects, but certain in its ultimate results. All domestic animals, including cattle, sheep, goats, hogs, dogs, cats, horses, and poultry are subject to this disease. Sheep and horses are practically exempt, but when inoculated with the virus they contract the disease. Cattle and poultry are especially susceptible.

## CAUSE.

It has long been known that tuberculosis occurs most frequently in certain families among human beings. This is just as noticeable among the lower animals.

The first, and perhaps the natural inference was that the disease was transmitted by inheritance. This theory was generally accepted for a great many years, and not until the infectious nature of the disease began to be suspected did doubts arise as to the correctness of this view.

Since Koch's discovery that tuberculosis was invariably caused by the tubercle bacillus and nothing else, and that tubercle baccilli produced no other disease, the fact that tuberculosis runs in certain families had to be explained in some other way.

This fact is generally explained in this way. When infectious diseases. such as smallpox, yellow-fever, etc., occur in the form of an epidemic it is noticed that certain individuals are always attacked first, others later, and still others not at all. Some experience a light attack and recover, while others have a severe attack and die. This is explained by saying that the latter class of persons is predisposed to take the disease. Some animals, as well as some men, are more predisposed, or in other words they have less power to ward off an attack of disease than others. The greater an animal's predisposition, the easier will be the attack, and the greater will be its suffering as a consequence. Just as certain physical characteristics, such as size, form and color are transmitted from parent to offspring, certain biological characteristics are also transmitted, of which predisposition to disease is one. The predisposition to attack by tuberculosis; or in other words, the inability to resist an attack of this disease is inherited. It is thought by some that the disease itself is inherited, but this is erroneous.

As to why tuberculosis runs in families, one other factor besides the inheritance of predisposition must not be forgotten.

An animal or child born of tuberculosis parents may be said to inherit the chance of becoming infected. It is constantly associated with a tuberculosis mother and is exposed to every danger that such a mother creates by her presence.

The continued breeding of tuberculosis animals will produce a weak family; weakness of the body, whether of tuberculosis origin or not, predisposes the offspring of tuberculosis.

The present method of breeding the cow as milk-producing machine has produced constitutional weakness in many individuals of the milk-producing families.

Dairymen have found out by experience that cows which are confined in small stalls, will produce more milk on the same amount of food than those which have a free run in fields or lots. Such close confinement reduces the vigor of the cow and predisposes her to tuberculosis.

Dairy cows, as well as beef cattle, should have plenty of exercise in the open air. Exercise in fresh air will not prevent all cases of tuberculosis, but it aids in maintaining a healthy condition of the lungs and invigorates the constitution. This will certainly aid to prevent the contraction and spreading of this disease.

## VENTILATION AND LIGHT.

Poorly ventilated and dark stables are in many cases worse than continued outdoor exposure. Light, as we have seen before, is very destructive to the tubercle bacilli. It is one of nature's best disinfectants. A free circulation of air carries away foul gases and brings fresh, pure air. The stalls should be so arranged that they can be kept clean and dry.

Climate to a certain degree influences the propagation and development of tuberculosis. Moist and changable climates favor the development and transmission of tuberculosis; while dry and rarified air, with a uniform temperature, tends to decrease its ravages.

## FOOD AND FEEDING.

Too heavy or forced feeding will weaken the animal as well as a deficiency in quantity or quality of food. Good, nutritious food should be given in proper quantities and at regular intervals. Too much food overtaxes the digestive organs, which decreases the vitality of the animal. Food of a poor quality may produce the same results.

## FAULTY BREEDING.

In and-in breeding, when carried too far, is apt to produce bad points, which will predominate over the good points of the parents.

Breeders who have developed distinct breeds, recognize the fact that continued in-and-in breeding is apt to produce an outcrop of tuberculosis.

Crossing the animals of two great milking strains which are highly developed is apt to produce an offspring which is poorly developed and predisposed to tuberculosis.

Animals which are commonly called washy—those having thin, flat chests and long legs are said to be predisposed to tuberculosis and should not be used for breeding purposes.

Exposure to cold and stormy weather, or anything which tends to depress the vitality of the animal, predisposes it to tuberculosis.

When tuberculosis exists in an animal in the chronic form, it may assume the acute form in a very short while if the animal is exposed to severe cold.

## HOW TUBERCLE BACCILLI ENTER THE TISSUES AND ORGANS.

The tubercle baccillus, like many other germs, may enter the body in one or more of four or five different ways.

1. It may be inhaled directly into the lungs in the form of dust to which the disease germs cling. This is probably the most common mode of infection for people and grown cattle.

The germ itself has no power of moving; but when matter containing it, such as sputu and material coughed up from the lungs and feces from animals with intestinal tuberculosis dries, it may be reduced to dust; this dust is then readily carried into the air, taking the disease germs with it. A single particle of dust may contain innumerable germs. When the germs are thus inhaled they lodge in the lungs and air passages, and when conditions are favorable they remain and produce pulmonory tuberculosis.

2. The germs may be taken directly into the stomach and digestive tract by means of food containing them; which is most commonly milk or meat from tuberculosis amimals, and in some cases it may be caused in the human family by eating eggs from tuberculosis fowls.

It was first discovered by Klebs, in 1868 that tuberculosis could be caused by feeding tuberculosis food to animals. Repeated experiments since that time have been made, which go to show conclusively that infection through the digestive tract is not only possible, but very frequent. Pigs seem to be especially susceptible to this form of tuberculosis. The pig seems to be a favorite host for the baccillus of this disease. It is also frequently allowed to consume the offal of beeves which may have this disease. It is also frequently fed on skim milk, and the slime from cream separators, which is in many cases a prolific source of disease germs. Intestinal tuberculosis is frequently found in poultry. This may be accounted for in pretty much the same way as in the case of pigs.

Intestinal tuberculosis is common among young animals which are allowed to consume the milk of tuberculous mothers. This frequently assumes the acute form in a short time and the animal soon dies.

3. The germ may enter the tissue directly through a wound in the skin and establish a tubercle. This mode of infection is not very common in nature, but is sometimes produced experimentally in the lower animals.

4. Infection through the genital organs is also possible. Animals, both male and female, have been known to have tuberculosis of the genital organs. In this case either sex may be infected during copulation.

5. Intra-Uterine Infection. The passage of the germ into the embryo or unborn fœtus. In this case the germ may be carried from the tuberculous sire in the semen, or it may be present in the ovum, or it may pass through the fœtal membranes and into the fœtal circulation. Intra-uterine infection is extremely rare, and we have but few such cases recorded.

### PATHOLOGICAL CHANGES.

There is no organ or tissue of the body which is exempt from tuberculosis. Some organs and tissues, by their structure and function, seem to be especially exposed to the action of bacilli, and thus more frequently becomes the seat of tuberculosis than other parts of the body, while still other organs possess a comparative immunity, and are not involved in the tubercular process, except in very rare cases.

Let us take up some of the organs most commonly affected by this disease, and note some of the changes which take place in them.

The lungs are thought to be the most frequent seat of tuberculous changes, and these changes differ considerably upon the subject of age of disease and the mode of entrance of the bacilli. The first change is that of miliorary tuberculosis. The lungs are studded with small grayish or yellowish nodules about the size of a pin-head. Sometimes these do not increase very much in size for a long time, but become calcareous, or break down into cheesy masses. However, this is not usually the case, but they increase rapidly in size until a number of them become confluent. When cheesy degeneration takes place, the entire mass then becomes softened at its center. These cheesy masses have no particular place of occurrence in the lungs, but may be found in any portion of them. In some cases when the disease is very advanced, these morbid masses are discharged into the bronchial tubes, and the fluid is expectorated, however this is not common. Usually a strong fibrous capsule develops about the diseased tissue, completely enclosing it and acting as a retaining wall.

Sometimes all of the different stages of development will be shown in the lungs at the same time.

## LYMPHATIC GLANDS.

In cases of tuberculosis of the lungs the bronchial and mediastinal lymphatic glands are usually involved. As a general thing, tuberculosis of these glands and the lungs occur together. The alternations in these glands are pretty much the same as in the lungs. At first the miliary tubercles develop. These are made up of the pre-existing tissue cells. These seem to multiply and grow excessively under the influence of the stimulation of the tubercle bacillus.

These individual miliary tubercles increase in size and become confluent, and a large tubercular mass is formed which undergoes a cheesy degeneration or becomes calcareous. As a result of the development of numerous tubercles in the lymphatic glands, these structures which are normally quite small, sometimes reach enormous proportions. They are said to grow even to the size of a man's head.

The pleura is sometimes the seat of this disease. This membrane has a very peculiar appearance when tuberculous. It becomes greatly thickened and is covered or filled with numerous small pearly tubercles, which are commonly called by the butchers "grapes". The bacilli are thought to reach the pleura sometimes from the lungs and sometimes through the diaphragm from the peritoneal cavity.

The intestinal canal is sometimes the seat of tuberculosis. In this case the disease is manifested by the development of tubercu losis. In this case the disease is manifested by the development of tuberculous ulcers on the mucus membrane of the intestines and stomach. This change is not very frequent in cattle, but it is not so rare to find tubercles beneath the mucus membrane. These tubercles are usually small; frequently not as large as a pea. They are firm and contain a yellowish cheesy material. The nodules which are frequently found beneath the serous membrane are usually small and contain a thick greenish fluid. When tuberculosis is present the adjacent lymph glands are usually diseased also, but in some cases we may have tuberculosis of the lymph glands, while the intestines are apparently healthy. The liver is not so frequently involved. It is thought the baccilli gain admission to the liver by way of the portal circulation from the intestinal tract. The tubercles in the liver may be small grayish bodies or large, yellow, cheesy masses.

The spleen and kidneys are rarely involved, and when they are tuberculous it is usually in generalized cases.

The uterus is sometimes tuberculous. When it is involved the walls are greatly thickened and the mucus membrane is studded with ulcers, and tubercles are found under the mucus membrane or in deeper parts of the walls between the muscles.

The ovaries are sometimes the seat of this disease, in which case they are very much enlarged. They contain the characteristic cheesy formations already described.

The udder is sometimes the seat of tuberculosis, when this is the case it is swollen hard and knotty. The tubercles are located in the mucus-membrane which lines the milk cavities and canals. Dr. Bang has found that abscesses of the udder are usually of a non-tuberculine character. In cross section of tubercles of the udder a uniform gray color, with the exception of yellowish and red dots and streaks is usually found. Tuberculosis of the udder is rarely accompanied by the common cheesy degeneration, but the tissue becomes quite hard.

The lymphatic glands situated beneath the skin around the udder become enlarged, hardened and sometimes cheesy when the udder is affected. It is thought that tuberculous abscesses of the udder cannot exist without the coincident or marked alterations in these glands.

Tuberculosis of the udder is one of the most dangerous forms of bovine tuberculosis to the human family. The milk from these cows in many cases is filtered through tuberculous abscesses, thus carrying many of the disease germs directly to the consumers of the milk.

The brain and spinal cord and their covering membranes each may become affected. The base of the brain seems to be the most favorable location, though there is no part of the brain or spinal cord which is exempt.

The muscles seem to have a partial immunity from the ravages of tuberculosis. This may be because they do not present such favorable conditions for the development of the germ.

The bones are sometimes the seat of tuberculosis. Cases of this kind are more common in swine than in cattle. The spongy center of the body of the vertebra of the swine may exhibit yellow tubercles, after the carcass has been cut into right and left halves.

The articulations and bones of the limbs in cattle are sometimes affected by tuberculosis; and especially is this the case with tuberculous calves.

## SYMPTOMS.

It is very difficult, if not impossible in many instances to recognize bovine tuberculosis in its earlier stages; especially is this so when the disease is located in the organs other than the lungs. However, when the lungs are diseased, or the malady is somewhat advanced, it is not such a difficult matter to detect it As a rule, after the disease has existed for some time and has made some progress in its development, various groups of symptoms that differ according to the seat of attack will appear.

Probably the first symptom we have is a slight fever; however this soon passes away and is rarely noticed. The animals accustom themselves to their morbid condition and live on as before; with general health, appetite and spirits but little affected.

The symptoms in the advanced stages may be grouped under different heads, depending on the seat of the disease. When the lungs are affected the animals very often have a short, interrupted and dry cough, which is most apparent in the morning, after feeding or watering, and after exertion.

When the disease first makes its appearance the animals are often in good condition, and with good care and feeding they will usually keep up, and sometimes even gain during the earlier stages of the disease. However, as the disease progresses the the cough becomes more distressing, the animal grows poor, the hair becomes dull and erect, losing its healthy appearance; the skin becomes dry and pale, and becomes tender over the udder and other parts not well protected by hair. The eyes are dull and sunken in their orbits, because of the wasting away of the fatty tissue upon which they rest. The cough grows more frequent, and is attended with more or less copious discharge through the nostrils of purulent mucus, containing particles of broken down lung tissue. The animal becomes more and more emaciated, though the appetite may be good and the food of the best quality. As these changes go on the quantity of milk, in milk cows usually diminishes.

There is sometimes an unusual sensitiveness and flinching exhibited when the sides of the chest are pressed; this sensitiveness is sometimes present from the commencement of the disease; in more advanced stages the animal tries to avoid the pressure or indicates the suffering it causes by groans.

If the lungs are examined by placing the ear on the ribs opposite them, various abnormal sounds may be heard—rubbing, grating, gurgling, etc., depending upon the character and condition of the lesion present. In some cases no sound whatever can be heard in certain areas, indicating that the process of breathing is entirely interrupted.

The time when the animal begins to decline rapidly and show plain external symptoms, depends largely upon the general care it has been receiving in the form of food, shelter, and general sanitary surroundings.

In tuberculosis of the intestines the symptoms are usually not so well marked as in pulmonary tuberculosis. The appetite is usually disturbed and irregular. We usually have diarrhœa, and sometimes periods of diarrhœa and constipation alternate. Bloating may be observed in some cases.

When the ovaries and uterus are diseased, nymphomania may be manifested, but as this occurs in other diseases it is not a positive evidence of the presence of tuberculosis. They often fail to breed, but when they do breed abortion is the common result, and this is sometimes the first indication of tuberculosis in a herd of cattle, although abortion is much oftener produced by other causes.

When the udder is tuberculous, the disease is usually confined to one, rarely two, and usually the hind quarters. The diseased part becomes hard and is not sensitive to pressure.

The character and appearance of the milk is unchanged (this is not the case in acute inflamation and other diseases of the udder) and no change can be detected, until the disease is well advanced; the milk then usually becomes flaky, thin and watery. It often contains tubercle bacilli in great numbers, and when used as food for man or animals it will very frequently produce tuberculosis. This fact has been demonstrated by numerous experiments.

When the bones and joints are the seats of tuberculosis the swelling is at first hard, but finally becomes soft. These swellings may develop at almost any part of the skeleton.

When these tubercles are close to the skin they sometimes break, or they may be opened in some cases under the false impression that they are abcesses. The contents of these swellings is thick and of a yellowish color.

The brain and its covering membrane are rarely affected by this disease. In these cases the animal usually shows mental disorder, sometimes by dullness or excitement, and other times by general stupidity. This form of the disease usually follows a rapid course and terminates in paralysis or convulsion.

## DIAGNOSIS.

The physical signs or symptoms previously mentioned will enable the skilled veterinarian to detect tuberculosis in well marked cases. Yet many dangerous chronic cases may exist in a herd which it would be impossible for him to detect by physical signs alone. The fact alone, that an animal coughs, is out of condition, or has a discharge from its genitals, or has a hard udder or a swollen joint or gland, does not necessarily indicate that the animal is affected with tuberculosis. Other diseases of a much less serious nature may be indicated by these symptoms. Dr. Fischer says: "Only when these conditions are considered in connection with other things, especially their history, the manner of their occurrence, the condition of other animals kept in the same stables, the known previous occurrences of tuberculosis in one or another herd, etc., then only can tolerable safe conclusions be drawn. A layman cannot draw reliable conclusions in this case. In most cases even the skilled veterinarian can not begin to detect the disease by ordinary means. Thus tuberculosis may be well advanced in some of the internal organs and still remain undetected by one or all of the symptoms and methods of physical examination.

## MODES OF DETECTION.

Fortunately we have three methods by which tuberculosis can be detected, even though no physical signs reveal its presence in an animal:

1. By microscopical examination of the secretions and tubercles that erupt on the surface, or that may be surgically removed from the skin or superficial tissues of the body.
2. By inoculating small animals with any of the secretions or diseased materials from the animals being tested.
3. By the Tuberculin Test.—The first two methods are very tedious and difficult to carry out, and in many instances no definite results are obtained.

The first method is impracticable, owing to the cost of the instrument and the inability of the ordinary farmer and dairyman to properly prepare the slides.

The method of inoculating susceptible animals would require from 20 to 30 days for the disease to develop, if it developed at all, because the small quantity of material used in the inoculation might not contain any of the tubercle bacilli.

The nasal discharge and saliva from cattle would not ordinarily contain tubercle bacilli, unless they had erupting tubercles in the lungs, or in the air passage, and sometimes tuberculous material, which is coughed up from the lungs, is swallowed when it reaches the pharynx.

It is safe to say that microscopical examinations and inoculation with the materials used will be of value in only a limited number of cases and under good conditions.

### TUBERCULIN TEST.

The Tuberculin Test is the nearest a perfect diagnosis agent yet discovered to detect the presence or the sbsence of tuberculosis among cattle. This is the method universally employed by vetinarians, and may be employed by the ordinary farmer or stockman with good results if they will take the proper precautions in making the test.

Tuberculin is a product of the tubercle bacillus; it is present in the bodies of all tuberculous patients. It was prepared artificially by Dr. Robert Koch by growing the tubercle bacillus in a nutrient medium, and then separating the tuberculin resulting from this process of growth by means of heat to kill the germs and filtering processes to remove the dead organisms.

The first object in preparing this toxin was to use it as a curative agent in human beings, but for this purpose it proved a failure. However in cattle it has proved to be a diagnosticum of the greatest value and importance. It has opened the way for the possible extermination of tuberculosis from our herds of cattle.

The use of tuberculin as a diagnostic agent is based on the circumstance, that when a certain quantity of this substance is injected into the tissue of an animal affected with tuberculosis, no matter in what stage of development the disease may be; a distinct temporary fever is the result. This rise in temperature is known as the "reaction" in the tuberculin test.

Before injecting the lymph the animal's normal temperature must be determined. To obtain the normal take the temperature every two hours for six or eight hours before the injection is made. In case the temperature should run to or above 102 degrees Fahr., the injection should not be made, as fever already exists, and the characteristic reaction will not always appear. After getting the temperature (which should be taken in the afternoon, as the normal temperature usually reaches its maximum in the evening,) the animals are injected with the tuberculin.

When using the tuberculin, made by the Bureau of Animal Industry, about 2 C. C., is hypodermically injected into each animal weighing 1,000 pounds; for bulls and animals weighing over 1,000 pounds, 3 C. C. is usually injected into each; for yearlings and small two-year-olds use 1½ C. C.; for calves, 1 C. C. may be used.

If Koch's or Pasteur's tuberculin is used, .25 C. C. is injected into each animal weighing 1,000 pounds; this must first be diluted with a 1 per cent. solution of carbolic acid to a strength of 10 per cent. This is easily done by pouring 5 C. C. of Koch's or Pasteur's tuberculin into a perfectly clean glass vessel and adding 19 drachms of 1 per cent. solution of carbolic acid.

Each drachm of this solution will contain a dose for an animal weighing 1,000 pounds; 1¼ drachms for bulls and larger animals; ¾ drachms for one and two-year-olds; and ½ drachms for calves.

The hypodermic syringe should be thoroughly disinfected before it is used. The tuberculin is injected under the skin, usually on the side of the neck, or over the shoulders.

Ordinarily the rise in temperature begins within ten to fourteen hours after the injection has been made, though in some cases it has been known to commence earlier or later. In the typical tuberculin reaction, the temperature rises gradually until a maximum point from two to four degrees above the normal is reached. when it gradually subsides again. In advanced cases, or after the test has been made several times, the rise in temperature may not exceed two degrees; but in the case of a fresh test, when there are no outward indications of disease, a rise not exceeding two degrees should not be accepted as sufficient evidence of disease.

Should the temperature suddenly rise four to five degrees, and remain the same for six or eight hours, we would not have a characteristic sign of tuberculosis; or should the temperature rise at one reading, and drop to the normal at the next two readings, then rise again at the next reading, this reaction ("double curves") is not characteristic. Animals giving these reactions should be isolated, and tested again in three or four months.

While animals are being tested they should be kept in stalls, and as near under normal conditions as possible. The same quantity of food and water should be given at the same time each day. Abrupt changes of temperature in the barn should be avoided.

The temperature of cows in heat, or in advanced stages of pregnancy, is usually above normal and they should not be tested at such times.

In speaking of accuracy of Tuberculin Test, Dr. W. H. Conn says—"Over this, as over every point, there has been much dispute, but at the present time there is an absolute universal consensus of opinion. Tuberculin, as a means of detecting this disease, is very accurate.

By this statement it is not meant that it never makes a mistake.

In some instances of advanced tuberculosis the tuberculin fails to give any reaction. These cases are rare, however, and are of comparatively little importance, because when they do occur the clinical symptoms are so well developed that the animal will be condemned independent of tuberculin. If, therefore, we are simply thinking of the matter of the detection of the disease, the failure to detect advanced cases is of little significance. Occasionally it may perhaps fail to detect a case not so far advanced. At the other extreme it has been claimed that there are some animals which reach to tuberculin but are not suffering from the disease at all. This is apparently a mistake, although, of course, it is an extremely difficult thing to disprove. There are quite a number of cases of reacting animals in which the disease has not been detected after the slaughter of an animal, but any one who knows the difficulty of making a thorough examination of a dead carcass will see at once that such evidence is at least unsatisfactory. If the case is an incipient one, the question of discovering it by post mortem examination is almost directly dependent upon how careful a search is made by the veterinarian. Sometimes he will examine an animal for two or three hours without success, but finally, after a search of several hours, will discover somewhere a small lymphatic gland which has evidently become tuberculous. Now such an animal is certainly infected with the disease, and, bearing in mind that we are here only considering the matter of the accuracy of the test not its value in other respects, it is very clear that the fact that we do have such cases of seeming mistakes is a simple testimony of its accuracy. It is the general belief among those who have used tuberculin most, that if the test is made in a proper way animals do not give the reaction, unless they have the disease at least in an incipient form.

If the test does give a reaction in animals that have seemed to have no signs of the disease, this is because the disease is so incipient that it escapes the attention of the inspector.

If there are cases where the healthy animal reacts, such cases are at all events extremely rare, and probably due to improper use of the tuberculin.

The Massachusetts Board of Cattle Commissioners have tested more animals than the United States Government and all the other states. They testify as follows:

"First, That tuberculin is a reliable agent for determining tuberculosis in cattle; second, that tuberculin, properly prepared and carefully handled, can have no injurious effects upon healthy cattle; third, that it is the only known means whereby a positive diagnosis can be made in the early stages of the disease."

## DISPOSITION OF TUBERCULOUS CATTLE.

What to do with infected animals after they have been discovered is the most important question in the whole subject of tuberculosis. As soon as the diseased animals have been singled out, they should be separated from the rest of the herd and kept under quarantine until the method of their final disposition is determined. The meat and milk, butter and cheese from tuberculous animals in a great many cases prove to be the source of infection of human beings.

This facts has been demonstrated by experiments with the lower animals.

Thus we may see that animals suffering of tuberculosis are a a great source of danger to the human family, as well as to the lower animals.

Some veternarians claim that tuberculosis cattle may be kept in an isolated place, away from healthy cattle, and from the food of healthy cattle, and be cared for by a separate attendant. Kept in this way the animal might be fattened and prepared for slaughter, but it should be killed and dressed only under veterinary supervision, in order to have the opinion of the expert in regard to the condition of the flesh. If disease is found to a dangerous extent the whole carcass must be condemned and destroyed, but if the disease is confined to a very few small foci, it may be sold for food.

This method of disposing of tuberculous animals has been advocated upon the grounds of economy, but as a matter of fact, the economy of this method is of an extremely doubtful character. It is more likely that investigation would show this method to be a very expensive one. The expense of feeding a tuberculous animal apart from the remainder of the herd, and supplying it with an extra attendant, and observing all the minute precautions to prevent the transferrence of the disease to other animals, make the fattening processs both expensive and extremely laborious.

After having fattened the animal it is necessary for the owner to employ a competent inspector to pass upon the carcass, and there is risk then that the whole animal may have to be condemned as unfit for food.

Taking all these points into consideration, there can be no doubt that, as a rule, the safest, cheapest, cleanest, and in the end the most satisfactory method of disposing of condemned animals is to destroy them outright, by burning or burying them, or they may in some cases be sent to fertilizer factories.

### USE OF MILK FROM CONDEMNED ANIMALS.

The milk from condemned animals should not be used until it has been sterized; or at least pasteurized. While it is true that many animals which react after the injection of tuberculin do not suffer from this disease to an extent which renders the milk dangerous, as an article of food: it is also true, that after a reaction has been detected we know that the animal has tuberculosis, and that it may have the disease in the udder or elsewhere to a degree to make the milk infectious.

Then knowing that an animal has tuberculosis in a dormant form, we cannot tell when the disease may become suddenly active, and by its rapid spread, make a formerly harmless animal dangerous, both to its fellows, as well as to the consumers of its milk.

On the account of the certainty of danger in many cases; the indefiniteness in others; and from the fact that the consumers of milk demand it, it is the best and safest policy to remove from the dairy all cows which give a reaction to tuberculin.

## HOW TO PREVENT TUBERCULOSIS.

The only way to prevent this disease is to weed out the infected animals.

In a Bulletin by Dr. Law, he says: "If he will the stock owner can extirpate this disease from his herd, and thereafter keep the herd from such contamination."

The following are the main precautions necessary to this end:

1. Board up the partitions of the stalls at the front; so that no two cows can feed from the same manger nor lick each other.
2. Keep each animal strictly by its own stall and manger.
3. When any animal is suspected do not let it use a drinking trough or bucket in common with other animals.
4. Avoid old milch cows and unthrifty ones, or keep them secluded from the rest of the herd.
5. Don't purchase from a herd in which tuberculosis has appeared, or in which cattle have died or been killed within a year or two. Resort first to tuberculin.
6. Don't add newly-purchased cattle to your herd until you have tested them with tuberculin; especially if they are the products of inbreeding.
7. In case of disease or unthriftiness in your herd, put the animal apart and have it examined by a veterinarian.
8. In case one animal in the herd shows tuberculosis, test the whole herd with tuberculin.
9. Kill all tuberculous animals and burn or bury deeply, in places to which no animals have access.
10. Disinfect the premises thoroughly; also all products of diseased animals and articles used by them.

## HOW TO DISINFECT.

All loose materials from the manger and stalls which are of no value, should be removed and burned. Before sweeping the manger, sprinkle the floor to prevent the dust from flying.

The wells, floor, ceiling, etc., should then be sprayed with a corosive sublimate solution (1 to 1,000), a two per cent. carbolic acid solution, or a two per cent. creolin solution.

The barn may then be fumigated by closing the doors and windows and burning two or three pounds of sulphur, in a vessel containing hot coals. After this has been done, throw open the doors and windows and admit "nature's great disinfectants"—dry air and sunlight.

# CLIMATE AND CROP SERVICE OF THE WEATHER BUREAU.

## WEST VIRGINIA SECTION.

PUBLIC BUILDING, PARKERSBURG, Sept. 15, 1900.

THE HON. J. B. GARVIN, SECRETARY STATE BOARD OF AGRICULTURE, CHARLESTON, W. VA.,

DEAR SIR:—In compliance with your request, I herewith submit the following report of the observations and work of the State Meteorologist for the 5th Biennial Report of the Board, covering the last two years, viz: 1899 and 1900.

### IMPROVEMENT IN THE SERVICE.

Great improvement has been made along all lines of meteorology during the last two years through the courtesy of the present Chief of the Weather Bureau, Professor Willis L. Moore, who has been willing to aid in every way in his power the extension and improvement of the work in this State.

The first improvement to be noted is that relating to the method of issuing the monthly report of the West Virginia section. At the time of the last report to the Board, this was being issued by the milliograph process, and only about 150 copies were being sent out; but now this monthly is issued in printed form, and 500 copies are sent out every month over the state and to other states, and the general appearance of this publication is very creditable. In this report is published the result of the observations of the voluntary observers of the State with a view of establishing its climatology. It is the desire of the Chief of the Bureau as fast as the appropriations will allow to provide one station in each of the fifty-five counties of the State, and it is hoped that within a very short time each county will have a station.

The Weekly Climate and Crop Bulletin of this section is very widely disseminated in the interests of the agriculturists of the State to all newspapers and postoffices, and it is watched with a great deal of interest as showing the condition of the various crops from their inception to harvest, furnishing a complete history of plant growth.

Another very important improvement that has been made since the present Meteorologist assumed charge of the station, is the extension of the map issue from a purely local one of about 50 to a general issue pf 300. This was made in the interest of the people of this State living along the Ohio River as far north as Wheeling, and as far south as Huntington, (a distance of about 200 miles) so that now these weather maps which show the condition of the weather all over the country at 8 a. m. each day, also the river readings and the forecasts, are posted all along this stretch of territory before 4 p. m. of the day of issue. As showing the interest taken in this extension, a few extracts from the many letters received, are published herewith:—

Edward Wagner, wholesale grocer of Wheeling, says: "The map will be very useful, *and will at times save us considerable money.*"

Geo. K. McMechen & Son Co., wholesale dealers in preserves, jams, pickles, etc., Wheeling, states: "*We are more than interested in the changes of the weather, and believe the map will be beneficial in our business.*"

### FORECAST DISTRIBUTION.

The card forecast distribution has been extended throughout the State as fast as the extensions of the mail service would permit, so that the daily forecasts of the Bureau are now reaching every part of the State, and in almost every case where a new postoffice is established, the postmaster at once writes to be put on the list to receive the forecast. It has been tried recently to extend the benefits of the daily forecasts in this section (State) so as to reach the farmers living on the rural free delivery routes; but in every case the carriers leave too early for such distribution. They invariably leave their postoffices in the morning, whereas if they left at *noon* it would be possible to place the forecast in the hand of every farmer and other person interested along these routes on the day of issue, which would prove of inestimable value to them. As to the extension of this branch of the work throughout the State, it will be necessary for the local orders of the Grangers at the Farmers' Institutes to take this matter up with their postmasters in such places where free rural delivery has been established, before this extension of the work can be established. The Weather Bureau stands ready at any time to extend this branch of the work.

Quite a number of requests have been received during the past two years for information relating to the weather, especially for temperature and rainfall data, from people living outside the State, who desired this information for the purpose of ascertaining facts with regard to the weather in different portions of the State with a view to settlement. This then shows the importance of the observers' work, and how it may induce immigration to his section.

As this State now raises a large amount of fruit and early vegetables, it may be of great importance to all those interested to here note the results of some investigations recently carried on by the Weather Bureau at the direction of the Honorable Secretary of Agriculture, James Wilson, with a view of affording means and methods for the protection of these industries from frost. The following is taken from Farmers' Bulletin, No. 104, "Notes on Frost," by Professor E. B. Garriott:

## HOW FROST IS FORMED.

The atmosphere of the earth always contains more or less moisture in an invisible form. When at a considerable elevation above the earth, this moisture, or acqueous vapor, is condensed, clouds are formed; when the process of condensation is more active and the temperature of the air is above freezing, rain falls; and when the temperature of the air is below freezing, snow is produced; when the moisture of the air in immediate contact with the earth is condensed at temperatures above freezing, dew is formed; when at temperatures below freezing. frost is deposited. Frost is, therefore, the moisture of the air condensed at freezing temperatures upon plants and other objects near the surface of the earth.

In the process of frost formation the temperature of the air a few feet above the earth is commonly several degrees above freezing. The surfaces upon which frost is deposited must, however, possess freezing temperatures. The manner in which frost is deposited on plants and other objects is very similar to that observed when the air moisture of a room is frozen and deposited upon window glass, the temperature of which has been reduced to freezing by the out-of-door cold. In the case of the frost on the window glass the process is one that can readily be understood. Some explanation, however, is required of the formation of frost, which requires freezing temperature, when at times a temperature *above freezing* is registered a few feet above the surfaces upon which frost appears.

There are several processes by which the temperature of plants may be reduced below the temperature of the air which surrounds them. The most important of these processes is radiation, by means of which heat escapes from objects and passes into the surrounding air.

In the frost-forming process heat from the sun which is absorbed by the earth and by plants during the day is lost by radiation at night. During the day the earth both absorbs and reflects the heat received from the rays of the sun, and the lower stratum of air is warmed by this reflected heat. During the night, when no direct heat is received from the sun's rays, the lower air stratum receives no reflected heat, and, at the same time, heat which has been absorbed by the earth is radiated, or, in other words, it rises through the overlaying air, though not necessarily and entirely as sensible heat; that is, heat perceptible to the senses. In the frost-forming process there is another very important factor in the production of cold; that is, the evaporation of moisture from the earth and from plants. The nature and composition of frost require that the air in immediate contact with the surfaces upon which frost forms shall contain moisture. This is moisture that has been stored in the earth in visible form, i. e., in the form of water, and which has escaped from the earth, not as visible moisture, but by the process of evaporation and in the form of aqueous vapor. Some part of the heat stored by the earth during the day is, therefore, lost in evaporating the moisture contained in plants and in the earth. The heat utilized in this process is retained in the air, not as sensible, but as latent, heat. Heat is rendered latent, in the same manner, when it is used to boil away water, and it again becomes sensible or liberated heat when the water vapor produced by boiling, which is a rapid process of evaporation, is again condensed into water. It appears, therefore, that while the temperature of surfaces upon which frost forms, and of the air in immediate contact with them, is lowered by the evaporation of moisture from the surfaces, the influence of the process does not extend to air a few feet above the ground.

Another method by which plants loose their heat is by convection, by means of which they are chilled by contact with colder air. This process, while important in the presence of freezing air temperatures, can scarcely be considered a factor in the formation of frost proper, which is usually accomplished when temperature observations show the air to be above freezing.

Another element in the formation of frost is found in the fact that air, like fluids, arranges itself according to its density or weight. Thus the air in immediate contact with the earth becomes heavier as its temperature is lowered by the radiation of heat and settles into depressions or valleys and over lowlands, causing, at times, frost in low lying districts, while neighboring higher grounds escape the visitations.

## SEASONS OF FROST.

Generally sgeaking, agricultural products in some parts of the United States are menaced by frost from the time nature begins to extend her mantle of green from the citrus regions of the South toward the grain fields of the North until the vendured area contracts southward before the first winds of winter; from the hour that seeds germinate and buds blossom until crops are gathered; from early spring until late fall. As a rule, the critical periods are during the early growth of plants and when the fruit is in the bloom, and again when crops are maturing.

In the first instance vegetation is threatened by the frosts of early spring, and in the latter by the frosts of autumn.

### WHEN TO EXPECT FROST.

As the conditions which produce damaging frost are subject to modifications which are as numerous as the kinds of crops raised, and as varied as local typography, local climate, and local soil conditions in the various sections of the United States, the writer, in attempting to treat briefly a subject which is so diversified in its aspects, is confronted with many difficulties. Suffice it to say that with other atmospheric conditions favorable for its occurrence frost may, as a rule, be expected when temperature, as reported by stations of the Western Bureau, falls to a point 8° to 10° above the freezing point. As previously stated, the surfaces upon which frost is deposited must possess freezing temperature, although the temperature of the air a few feet above the surfaces may be several degrees above freezing; and it is the temperature of the air, in some instances many feet above the ground, that is given by the Weather Bureau observations. Another atmospheric condition favorable for the occurrence of frost is a clear, cloudless, and comparatively calm night. The presence of clouds retards radiation or loss of heat from plants; the clouds act as a screen in preventing the heat collected from the sun's rays during the day from escaping into into the upper air. When clouds are not present and the withdrawal of the sun's rays causes a rapid cooling of the air at moderate elevations, the warmer air which collects near the surface of the earth during the day rises, and the cooler upper air, owing to its greater density or weight, settles to the earth. It will be noted that clouds not only prevent the escape of the warm air in immediate contact with the earth, but also blanket, as it were, the upper part of the lower air stratum. Calm or comparatively still air is a condition which favors the formation of frost. On windy nights the air is disturbed and is not permitted to arrange itself in layers according to its density, with the densest and coldest air near the surface of the earth; it is kept mixed up by the wind.

During a still night, when frosts occur, the surface of the hillside cools by radiation, and hence cools the air in contact with it; the latter flows downward as long as its cooling by radiation and conduction exceeds its warming by compression. Inasmuch as its cooling depends on contact with a still colder soil or plant, it soon accumulates in the lowlands as a layer of cold air, which grows thicker during the night by the steady addition of the thin layer of descending air in contact with the ground on the hillsides. The warmer air, which has not yet had an opportunity to cool by contact with the ground, floats on top of the cold mass; it spreads out toward the hills, and is continuously furnishing its heat to the adjacent hillsides as fast as it comes in contact with them before it also cools and descends. The formation of the thermal belt seems to depend largely upon this gentle circulation during the nighttime. The lower limit of the belt is defined by the depth of the accumulation of cold air in the confined valley and rises higher in proportion as the night is clearer and longer, and also in proportion as the valley is more or less perfectly inclosed. The upper limit of the thermal belt may depend upon the strength of the wind and the general temperature of the air. But if there be no wind, then it depends equally on the freedom of radiation to the clear sky and on the above-described circulation of air."

The facts quoted in this article show that frost may be expected on low grounds at times when higher grounds escape the visitations, and the lesson they teach is that early and tender crops should, so far as may be practicable, be confined to crests, hillsides, and mountain sides, and later and hardier crops to the lowlands and valleys.

Local climate, as it is influenced and regulated by the proximity of bodies of water, must be given great weight in calculations regarding frost. Frost is less likely to occur in localities swept by moisture-laden air which has crossed a considerable body of water. This is more especially the case in the fall of the year, when the temperature of bodies of water is reduced very slowly; and in the South, where the water temperature continues relatively high throughout the year, the influence of the water is especially marked. During the colder months air is not only warmed in crossing considerable bodies of water, but it also absorbs moisture, which, although invisible in the form of water vapor, has the effect of retarding the radiation of heat from the earth. In fact, so pronounced is the influence of water and water vapor that localities which with reference to exposure to west and northwest winds are, as it were, in the lee of large bodies of water are comparatively free from frost visitations. Along parts of the east Florida coast which are protected on the west by the Indian river, frost is said to be unknown, and throughout the central and northern sections of the United States, localities which are protected on the west and northwest by bodies of water of considerable size are not only favored, by reason of their position, with conditions which do not promote the formation of frost, but also receive the benefits derived from heavier falls of snow.

Local soil conditions constitute, to a certain extent, a factor in the formation of frost. As a rapid loss of heat is promoted by an active evaporation of moisture, it is evident that, with other conditions equal, frost is more likely to occur on damp than on dry ground, provided, however, that the ground is not too moist, for in the latter event the amount of moisture evaporated and added to the air would have a tendency to retard the radiation of heat from the earth. And herein lies the distinction, so far as frost formation is concerned, between moist air and moist soil. An excess of moisture in the air, in preventing, to a degree, the radiation of heat, is unfavorable to the formation of frost. As frost is the moisture of the air in immediate contact with the earth condensed at freezing temperature, it follows that the earth, from which the moisture of the air is drawn, must contain more or less water, and it is evident that damaging frost will occur with a limited rather than with a large quantity of moisture arising from the earth and a moderately moist and comparatively still air. Both of these conditions usually obtain following, but not too closely following, the rains of spring and autumn. The character of the soil as regards its capacity for retaining moisture must also be taken into account, more especially during periods of comparatively dry weather. Moist soil, and the vegetation which springs from it, is chilled to a lower temperature by the evaporation of moisture, and is therefore more subject to visitations of frost than soil which is dry, or into which water penetrates deeply, leaving the surface dry, or soil which sheds the rain and does not absorb and hold water. It is important to note, however, that very moist soil, or soil which contains a large amount of surface water, is, owing to the quantity of moisture yielded to the air, not so subject to the heavy and damaging frosts which visit plants on moderately damp ground or ground that has a small capacity for moisture.

## PROTECTION FROM FROST.

A discussion of methods of protection from frost calls for a consideration in great detail, not only of the several approved processes of protection and the extent to which they can be applied in connection with the various crops, but also the value of these processes under the varying conditions of local topography, local climate, and local soil conditions.

It is evident, in the light of the foregoing statements, that fruit and vegetable growers in rolling and hilly country, or when located in the lee, as regards west to northwest winds, of bodies of water, can, to some extent, so place their earlier and tenderer fruits and crops that they will, in the first instance, avoid the lowlands and valleys, and in the second take advantage of the more moderate and moist air that crosses water surfaces. For further protection the grower must depend upon artificial appliances. These appliances are designed to produce the following effects or results: To prevent a rapid radiation of heat from the earth; to charge the air with moisture; to warm the air; to create artificial drafts, whereby the air is mixed and the cold air is not allowed to settle to the surface of the earth; or to actually cover or roof in plants.

## DEVICES FOR PREVENTING RAPID RADIATION OF HEAT.

Devices designed to prevent a rapid radiation of heat from the earth include screens which can be drawn over plants, vineyards, and groves; loose substances with which low plants may be covered; and smudge fires built to the windward of areas for which protection is desired. These devices, which of a necessity are operative for very limited areas, are described by Professor Hammon in Bulletin No. 23, Weather Bureau, as follows:

*Glass Screens.*—In greenhouses and hotbeds advantage is taken of the peculiar property of glass which allows the heat rays of the sun to pass through it, and is almost impervious to the dark *heat* rays from the earth and plants. This is one of the most perfect screens possible, since it not only prevents the loss of heat by radiation, but receives and retains the heat from the sun. The expense precludes its adoption except for the protection of valuable plants and flowers.

Screens of other solid materials have been quite extensively used in protecting vineyards and citrus groves where intense cultivation is practiced and where the location of the groves near an excellent market admits of profit even with expensive methods of cultivation.

*Cloth Screens.*—In Italy and portions of France screens made of muslin strung on wire stretched on poles above the tops of trees or vines have been used extensively. These screens are drawn on nights when frosts are probable, and are pushed back during the day. When the season has advanced so far as to preclude further danger, they are taken down and stored. Of course such a plan could be operated only on a very limited scale, and would then be expensive. This plan has been recently successfully tried in the orange groves of southern California.

*Lath Screens.*—During the past few years screens made of laths fastened to ordinary telephone wire (the spaces between them being about the width of the laths) have been extensively used in Florida. These are spread over a frame erected above the trees or plants. The screens serve not only as a fair protection from frost, but also as a shade from the hot sun. When no longer needed, they can be rolled up and stored away for preservation. At first thought it would seem improbable that a screen covering only half the space (the spaces being as wide as the laths) would afford much protection; but when it is considered that laths have considerable thickness it is plain that while only one-half the vertical rays are screened those inclined between the vertical and horizontal are partially intercepted by the edges as well as the faces of the laths. As a matter of fact, about three-fourths of the sky is screened by this means. By placing the laths in north and south directions the direct of the morning sun are completely cut off from the orchard, which admits of the temperature rising slowly. This reduces the liability of injury to plants.

*Other Methods.*—Strawberries and other low plants are frequently protected by covering them with straw or other loose substances.

Frequently young potato plants are saved by plowing a furrow alongside and allowing the dirt to bury them.

Cranberry growers in the marshes of Wisconsin flood the marshes when frost is expected. In this case the protection is probably due, for the most part, to the high specific heat of the water, as only portions of this land are submerged.

*Smudge Fires.*—Since on cloudy nights radiation is so reduced as to prevent the formation of frost, many have thought that an artificial obscuration of the sky by means of dense smoke would be an excellent means of protection. The efforts of this character which have been made have resulted in decidedly varying success. In the wheat fields of the Dakotas excellent protection was obtained in limited areas, while the experience of orchardists in Florida and southern California has not shown such uniform success.

Since it was supposed that the protection resulted from the obscuration of the sky by means of smoke, the best protection was expected from the use of that fuel which would produce the greatest rmoke.

In the Dakotas the best and most convenient material at hand was the straw of the previous year's crop, which had been left in the fields all winter and through the rainy spring, until it was quite thoroughly soaked with water.

In southern California and Florida straw was scarce, and where it could be obtained it was much drier than that used in the Dakotas. Consequently tar, crude petroleum, and other similar smudge materials were substituted; but the results have not been, as a rule, satisfactory, although the smoke was equally dense. However, quite successful results were obtained by Mr. Buck, Mr. La Rue, and others in the Vacaville and Sonoma sections by burning damp stable manure in sacks scattered throughout the orchard.

Devices for preventing a rapid radiation at night of the heat absorbed by the earth during the day can be utilized only for comparatively small areas. The screen devices, also, by reason of their cost, are available only for the smaller orchards and vineyards whose products command early market prices; the same may be said of coverings of straw and other materials for strawberries and other low plants. Smudge fires can be used to advantage for orchards, vineyards, and ground plants, and even for the smaller grain fields, and would be particularly efficacious in protecting crops and plants in low or bottom lands over which, on still nights, the smoke from smudge fires would settle There is no device at present known that will, by preventing a rapid radiation of heat, afford any material protection to the great grain fields of the West and Northwest.

### DEVICES FOR ADDING MOISTURE TO THE AIR.

Smudge fires made of damp material have been more successfully used for the purpose of affording protection from frost than those made of tar, crude petroleum, and other dry materials, for the reason that in addition to creating a dense smoke they add to the atmosphere a considerable amount of evaporated water, which, though invisible, serves to retard the radiation of heat. When any considerable amount of water is thus converted into vapor and is distributed in the air which covers the area to be protected, a portion of it is likely to be condensed by the surrounding cooler air and appear in the form of mist, which acts as an agent to prevent the escape of heat from the earth; and the act of condensation sets free in the air some of the heat that has been expended in the process of evaporating the water contained in the smudge-fire materials. Thus the process is well ordered throughout. In the first place, an undue quantity of heat, whereby undesirable drafts would be created, is not communicated to the air by the fires, and the final result is that in reliberating, by condensation, the water in the air the particles of moisture remain suspended in the air, and some of the heat of the fires is returned to the air in a form which, to a certain degree, warms it without causing currents which would be calculated to disturb the smoke cloud, or pall, and the moist air which overlie the ground and upon whose presence the saftety of the plants from frost depends.

As smudge fires made from damp materials are one of the recognized devices which have been found to be more or less effective in affording protection from frost, the following description of methods which have been adopted for utilizing them in orchards is quoted from Bulletin No. 23, already referred to:

*Fires of Damp Straw and Stable Manure.*—Have the fuel, in small piles, distributed throughout the orchard in advance; the more numerous the piles the better. With the same amount of fuel the best protection is obtained from small and frequent fires, since with small fires the upward draft is reduced to a minimum, and the more frequent the fires the more uniform will be the distribution of heat.

*Sacks of Manure.*—A decidedly preferable method is to pack damp stable manure in common grain or burlap sacks, by which it can be conveniently handled. They should be distributed through the orchards in rows of about 100 feet apart and about 50 feet between sacks in each row. When it is found necessary to protect, a small amount of coal oil is poured upon each sack and ignited. It is usually unnecessary to fire more than every second or fourth sack, the remainder being left for later occasions. These sacks will burn with a smouldering fire for several hours.

The amount of heat which is set free by burning one sack of manure weighing about 50 pounds and condensing the water vapor near the earth would be sufficient to raise the temperature 20° in a space 75 feet square and 25 feet deep. If one-fourth of this heat remained within this region needing protection, which seems to be a reasonable estimate, ample protection would be obtained for almost any ordinary conditions.

*Bales of Wet Straw.*—Mr. T. A. Morrison, of Riverside, California, suggested the use of a similar plan, in which bales of wet straw were substituted for manure. This plan has been tried with fair success. One hundred pound bales were cut in four pieces, a tie wire being left about each piece, and if properly dampened will burn with but little care, causing a small smouldering fire.

*Prunings.*—The prunings of the trees, which are usually removed shortly before the period when frosts are likely to do their greatest injury, are excellent smudge material, and should always be preserved for this use. They should be piled in open spaces throughout the orchard or vineyard or burned at times when protection may be needed. The best results will be obtained from as small fires as will result and burning the prunings.

*Portable Smudge Fires.*—A number of excellent devices have been tried, in which the fires were built upon some vehicle by which they could be moved about the orchard. The advantages of this plan are several.

First. The fire can be moved to the section where most needed, which is generally along the windward side of the orchard.

Second. The loss of heat by an upward draft is almost entirely prevented, since the fire does not remain in one position long enough to establish such a draft. On this account much larger and, consequently, fewer fires, with equal efficiency, are possible.

Third. There is a much more uniform distribution of heat and smoke throughout the orchard.

As smudge fires prepared and applied in the manner above indicated are inexpensive, to a degree effective, and easy of operation, they constitute the method which for practical use and utility seems best adapted for general use in orchards, vineyards, gardens, truck farms, and small fields, as a protection from frost. Among the many devices that have been employed for holding and carrying these fires the following has been used with especially satisfactory results by the Fleming Fruit Company, of Visalia, California, and will doubtless prove equally effective in other sections:

Wire frames (chicken-yard fencing) are built on low truck wagons and stretched from four wagon stakes and heaped over with wet manure, Dirt is then thrown on the wagon beds to protect them, and pots of burning tar are set underneath the straw roof. A barrel of water on the wagon is used to keep the straw wet. The wagons are driven about and do the best work, as they can go wherever the most needed. The smoke and vapor are carried to the rear as the wagon moves, and, being carried at once out of the rising heat, fall close to the ground in a long, white trail. At daylight 400 acres of orchard are covered with a white fog, extending from the ground to about 20 feet high. Similar fires are used as stationary smudges, the wire netting being stretched between four stakes driven in the ground.

Crude petroleum, supplied to a burner from a tank on a wagon or truck, has been used with success by Mr. R. H. Howard, of Riverside, California. Over the burner is placed a large wire basket containing mineral wool, which is kept saturated with water supplied by a tank, also placed upon the wagon. Wet straw and manure can also be used. The apparatus can be driven where most needed. The burning coal oil gives off a dense smoke, while the wet mineral wool furnishes a vast surface from which evaporation can take place, and at the same time the material will not be consumed.

## DEVICES FOR CHARGING THE AIR WITH MOISTURE.

Aside from the smudge fires, Bulletin No. 23 quotes devices which have been adopted to charge the air directly with moisture, some of which are constructed on a plan too elaborate and expensive for general use.

The first operation involved is the evaporation of water in large quantities, either by means of evaporating pans or by the use of boilers with connecting pipes whereby steam can be generated, carried, and thrown into the air in different parts of a field or orchard.

Spraying and sprinkling plants in times of threatened frost has also been attended with some degree of success. At the Everest ranch, at Riverside, Cal., sprinklers are placed at the top of 50-foot masts, which fill the air with a very fine spray. In nearly every instance the protection against frost by this method has been sufficient.

Sprinkling gardens before sunrise on frosty mornings has proved of decided value.

Secondly, irrigation, which of necessity can be used only to a very limited extent and in certain favored localities, has been found to afford very complete protection from frost in fields, orchards and vineyards which are equipped with irrigation ditches, and in the cranberry districts of Wisconsin perfect protection from damage by frost is secured by flooding the cranberry marshes the day before heavy frost occurs in that section.

In no case should water be allowed to stand in orchards, vineyards, or gardens during the early growing period while danger from frost is possible, for the reason that water unduly promotes the growth of young plants and thereby renders them more susceptible to damage by frost and cold than are the plants whose growth is retarded.

The third operation involved in the California experiments was a direct heating of the air by means of fires. It was found that large fires caused a strong, upward draft of air, which had the effect of drawing in cooler air from the sides, and that well distributed small fires were attended by very satisfactory results.

Owing to the comparatively inexpensive character of the materials used in damp smudge fires, they seem the best adapted for common use in orchards, vineyards and gardens. Berries and other low plants can be protected with but little expense by coverings of straw and other light materials. Devices for actually heating the free and open air are expensive and of doubtful utility, and their value is dependent solely upon a comparatively still air and small, numerous, and well-distributed fires.

The more expensive methods include warming the air by means of open wood fires and sheet-iron stoves. These methods have been found to be fairly satisfactory on still nights. Coverings of cloth and other suitable materials are stretched on frames and the confined air is warmed by means of stoves. One extensive orange grower is building board sheds over his groves, the interiors of which will be heated by wood fires. When danger from frosts and freezes is past, the tops and sides of the sheds can be removed. On account of their great cost, coverings of this character can not, of course, be generally used.

Young potato plants can be saved from damage by frost by a covering of dirt. In large patches this can be accomplished by plowing a furrow alongside the rows of plants and allowing the dirt to bury them.

Gardens can be protected from frost by coverings of straw, paper, or other loose and light materials, or by damp smudges; and the latter device appears to be, in point of effectiveness and cost, the best adapted for general use not only for small areas devoted to gardens, but also for orchards, vineyards, and fields. The effectiveness of any method of protection is, of course, decreased as the area for which protection is desired is increased, and there is no process yet devised that can give adequate protection against frost and cold in the great grain fields of the country.

## CONCLUSIONS.

Experiments and observation seem to establish the following facts: The danger of damage from frost can be materially lessened by placing early and tender plants on high grounds and crests, and hardier plants in low grounds and hollows. When ground can be selected in the lee, or to the south and east of considerable bodies of water, the danger will be further lessened.

In all sections loose coverings may be used to advantage for protecting low plants, and damp smudge fires may be profitably employed in gardens, orchards, and small fields.

It is important to remark in this connection that none of the artificial devices described should be employed during the growing season except on the immediate eve of threatened frost. The necessity for observing this precaution becomes apparent when the fact is considered that any appliance for protecting plants from cold will maintain abnormally high temperatures when average weather conditions prevail. The effect of this process would be to force the growth of the plants and render them the more susceptible to damage by the late frosts of spring. In all sections and localities reached by the forecasts and special warnings of the Weather Bureau action to put into operation protective measures can be safely deferred until warning notices are issued. The Bureau has made provision for a distribution of frost warnings which is limited only by the resources of the telegraph, telephone, mail, train, and signal services, and agriculturists whose location renders possible the receipt of the warnings by any of the means referred to should adopt measures for securing them. That action in this direction would be profitable is shown by the testimony of those who have received substantial benefits from the warnings.

Quite a number of persons pretend at this time to make long-range forecasts, and it may be interesting to note what Prof. Moore, the Chief of the Weather Bureau, says with regard to this matter:

"It is the dream of the meteorologist some day to accurately forecast the weather weeks and months in advance. But so far this much-to-be-desired object can be realized only in a dream. What a wonderful conservation of human energy would result were it possible to tell the farmer when the great corn and wheat belts would have abundant rain during the next growing season, or when droughts would parch vegetation, or truthfully to inform the planter of the South that the approaching season would be favorable or unfavorable to the production of cotton. Effort would be withheld in one part of the country and prodigious energy exerted in another.

"When our extensive system of daily observation has been continued for another generation, a Kepler or a Newton may discover such fundamental principles underlying weather changes as will make it possible to foretell the character of coming seasons. If this discovery is ever made it will doubtless be accomplished as the result of a comprehensive study of meteorological data of long periods covering some great area like the United

States. At any rate, we are certainly now laying the foundation of a great system which will adorn the civilization of future centuries.

"At the present time I know of no scientific man who essays to make long-range weather predictions, and I *would especially caution the public against the imposture of charlatans and astrologists, who simply prey upon the credulity of the people.* As storms of more or less intensity pass over large portions of the country every few days during the greater part of the year, and as it is seldom that the weather report does not show one or more storms as operating somewhere within our broad domain, it is easy to forecast thunder-storms about a certain time in July, or a cold wave and snow about a certain period in January, and stand a fair chance to become accidentally famous as a prophet. You may select any three equidistant dates in January and forecast high wind, snow and cold for New York City, and stand a fair chance of having the fraudulent forecast verified in two out of three cases; provided that you claim a storm coming the day before or after one of your dates to be the storm which you expected.

"*I believe it to be impossible to-day to make a forecast based fairly upon any principles of physics or upon any empiric rule in meteorology for a greater period than one or two days in winter or for more than two or three days in summer;* and there are times in winter when the movements of air conditions are so rapid that it is extremely difficult to forecast even for the space of one day. The Weather Bureau takes the public into its confidence in this matter and does not claim to be able to do more than it is possible to accomplish.

"E. C. VOSE,
"Section Director, Meteorologist to the Board."

# OUR PUBLIC ROADS.

BY RUSSELL L. MORRIS, C. E., MORGANTOWN, W. VA.

In this country there is no question of more vital importance to our people as a whole than the subject of public highways. They are in many instances the only outlets to large sections of country, and their location, construction and grades determine to a great extent the value of land along said highways. If the location is good, the grade easy and the road bed solid, of course the road is of more importance than one that is deficient in one or all of these respects. So in this article I shall endeavor to discuss the subject along the following lines: First, location; second, grades; third, construction; fourth, drainage; fifth, material, and sixth, maintenance.

In locating a road, care should be used to see that the road reaches the points to be connected by the most direct and practical route. Of course it is sometimes necessary to go out of a direct line to pass by or through another point of more or less practical importance, or to follow up some stream or ravine to its head in order to get through a low gap in a ridge or mountain. These are points that should have careful study. Also the location geologically deserves more study and consideration than it usually receives. By geological location, we mean a location as near as possible along some definite strata, or in reference to some definite inclination of the strata, or both. If we locate with reference to the strata alone, we must observe what strata will make the best road bed. Some strata is water bearing, soft and of a disintegrating character, such as will form mires, ruts, etc.; other strata is of a less disintegrating character, less water bearing, not so easily cut into ruts or reduced to a mire. This has its advantage over the former, as we can readily see. Then if we locate with reference to the pitch, we observe which way the strata is inclined. This can usually be determined by noticing on which side of the streams the steepest banks predominate. If the strata dips, the water has an inclination to run down the slope of the strata, thereby cutting into the bank of that side, making steep bluffs and often abrupt precipices. Now this side is, of course, less subject to slips, because the strata is inclined in the opposite direction from the direction of the slip. But let us look on the other side of the stream. What do we find there? Often a flat bottom. The slightest cut causes great masses of earth to break loose, so the question of road location can here be studied in a scientific and economical manner. Of course, these things cannot be taken into consideration for the location of every road, but by giving the matter proper study, they often could be used to advantage, and would be a matter of great importance in the expense of maintenance in after years.

The subject of grades is one of the utmost importance. Who is there that has not witnessed the punishment often inflicted upon an overloaded team by an enraged driver who has attempted to make it pull a heavy load up a steep grade. The chain is no stronger than its weakest link. Just so with grades, a team cannot economically reach its destination with a heavier load than it can pull up the steepest grade. We need to awake from our slumbers in regard to grades and locations. Both require the services of men trained along these lines. Every county should have a profile and map of every road that it owns. There should be bench marks accurately and firmly planted and their elevation carefully noted on them. They should also be accurately located on the maps, one of which maps every citizen should be able to possess. If we have a complete road map of our county and it is kept revised from year to year as it needs it, no better investment can be made. If we have accurate profiles of each road with bench marks carefully noted upon them, we are always able to work for improvement and figure closely the cost before the work is begun. Besides the value of the bench marks for other purposes will often be of vast importance.

The construction of a road is another subject that requires more space than a paper of this kind can offer. But if we construct along the best and cheapest line, we have served the best interests of those who have put the matter into our hands. So if we have located with care, levelled over the centre line, and made a profile, then the expense of taking cross-sections and calculating the amount, and kind of material to be moved resolves itself into a matter of economical importance, and adds but a very slight expense. Then the actual cost and economic value of the road can be and is determined before a shovel full of earth is moved. No road can be kept in a good condition that is not properly drained. Like all other road problems, it is a subject that requires close attention and good judgment on the part of the party in charge.

The streams that wind their ways through the country should be held at the proper distance from and at the proper depth below the road-bed. The ditches along the side of the road should not be shallow and above the road-bed, but on the other hand, deep, and often emptied into ditches that will carry the water away from the road-bed, for the less water that is near it the dryer it will be, and the less the expense required to keep it in repair.

The maintenance of a road depends a great deal on what strata the road has for its bed, unless we place upon the bed of the road a material of another formation. This is being done by a great many lovers of good roads when they are able to do so, and the locality and surroundings determine to a great extent the kind of material used. I shall pass the subject by saying that limestone, slag, sand and material of this kind seem to be the most available for the purpose in this country. The subject of maintenance is one of the most important of any of the subjects mentioned, for it includes directly or indirectly all of the other subjects mentioned or is most intimately allied to them. No road however well constructed will long remain in good condition unless it is properly maintained, and by this we mean properly drained, the road-bed kept in the proper shape, the proper care taken in regard to slips, washouts, etc., to keep the proper width between fences of the adjoining landowners, to keep the right of way cleared off, keep over-hanging bushes cut out so that the sun shine can get in, and keep the bed dry and solid. I may be called an extremist in my views, but I believe that every county should have in control of its roads a thoroughly scientific man, educated in some good engineering school. A man who has practical ideas and good judgment. Then and not till then will we have roads located instead of marked out, get the best grades, have them properly constructed and mapped, be able to work them up with reference to a permanent fixture, have the elevations of the county marked along them, letting them represent definite expenditures at a stated price for work done; instead of a rough guess and final acceptance of a poor job and general dissatisfaction among all concerned.

# REPORT OF POMOLOGIST.

In making this, my first report of the condition past and present with regard to the fruit business of West Virginia, I feel that the task is almost too great for me to undertake.

The fruit business in the way of increase has not been keeping pace with the increase of population which has taken place since I started out in life. At that time the United States had a population of 35,000,000 souls, and some of our old men prophesied that the apple business was going to be overdone, and were satisfied and contented with a small orchard. My father, brother and myself were able to gather about three hundred barrels in good seasons. We soon discovered, however, that we did not have as many apples as we could sell. We began to plant more trees of the varieties we considered the most profitable. Away back in the sixties we started full sail and kept on planting until some of the same old prophets began shaking their heads and telling us that we were making big mistakes; that the "business would be entirely overdone and apples would be worth nothing." But foolishly or not, we kept on planting until we have been able to gather over ten thousand (10,000) barrels of apples from our orchards in one season. Now with about 80,000,000, of people to feed in this country—in addition to the great European demand for our nice lucious apples—we find that we do not have half enough.

I have been trying to ascertain something near the amount of fruit grown in West Virginia, but I find it is almost an impossibility to do so.

In our County of Hancock there were grown the past season from forty-five to fifty thousand barrels of apples which brought paying prices. In addition to this there were a good many pears, plums, and some peaches. The man who thinks he can get something for nothing will be disappointed. The fruit business like any other business, to be successful, requires the careful attention of the owner. To plant trees in some waste place and then let them take of themselves, and wonder why they are not profitable is just about as wise as to turn your little sucking calves and lambs out in the woods and expect them to thrive. After giving this interesting subject a life study—along with practical experience—I will say that in my opinion no tough sod ought to be allowed to grow near a fruit tree. If you have hogs enough to keep the ground thoroughly rooted up, you are very nearly right; but in large, commercial orchards this is almost impossible. Apples and other fruit trees must be fed with suitable food. Plow the ground *not too deep* and cultivate every few years. If you can get clover to grow it is the best crop to enrich any land. No other manure is equal to barn-yard manure, in my opinion. The next best is pure ground bone meal.

When we plow and cultivate a bearing orchard, we use eight hundred (800 lbs) bone meal per acre. This may seem extravagant, but when we come to gather the fruit it adds to the profit side of the business.

The insect pest is one of the hardest problems the fruit growers have to solve. The canker or leaf worm has been very destructive the last three years, in many parts of the country. In Colorado, a comparatively new country, these worms are doing great damage. The only remedy yet discovered is thorough spraying. The insects start to work just as soon as the leaves are formed; then immediately after the blossoms drop, commence to spray. Use 1 lb. London purple to 175 to 200 lbs. water. In one week spray again. Sometimes a third spraying will prove beneficial.

The next pest is the Apple Moth. The same spraying will oust them also. We have over five thousand apple trees and spraying with us is quite an item. We set two tanks of water in the wagon, holding 100 gallons each, with a pump and hose on top of each tank. We have a man at each pump—a man to guide each horse—and a man to drive the team. We drive between two rows and spray as many as 1200 gallons per day- Of course this costs money, but come to Hancock County and look at three miles of orchard when there is a crop, and ex. amine the trees not sprayed, and then take a look at the trees that were sprayed, and decide for yourself whether it pays.

In the State of New York the worst pest is the Tent Caterpillar. They are trying to have a law passed to compel owners of orchards to spray. The same law ought to be in force in all fruit States. I have seen orchards which were not sprayed denuded of foliage, while others just over the fence which had been sprayed were in fine condition.

This year we have the 17 year Locusts. They made their appearance about the first of June, and lingered about 130 days. Their name is legion and they sing the same old song about Pha-ra-oh. They will kill young trees entirely if they are not protected, which is easily done. Cut off the ends of the limbs and draw them into a small body; then tie mosquito net over them and wrap the body of the trees with brown paper. One of our neighbors followed this plan this year and it was a success. Prof. L. C. Corbett, of Morgantown induced a few of the apple growers of West Virginia to send a few barrels of apples to the Paris Exposition. R. H. Brown and our firm of Charles

Brown's Sons shipped two barrels. We have the satisfaction of knowing that the West Virginia apples took second premium.

It is too early in the season to predict with any degree of certainty, regarding the coming fruit crop. Delaware and Georgia report a large crop of peaches. The Fruit Trade Journal predicts that there will be a fair crop over the country generally. So far as I can learn, West Virginia will not have a large crop. It will be interesting perhaps to the fruit growers of this State to study the following table, regarding the vast amount of apples exported from this country annually. I trust that my fellow fruit growers and farmers of the prosperous State of West Virginia, will make due allowance for this hasty report. I assure you all that I have your interests at heart and any inquiries on the subject will be cheerfully answered.

## APPLE EXPORTS.

A resume of the accompanying table is given below. The total exports of apples from the United States and Canada for the past season, as compiled by Mahlon Terhune, Freight Broker, Produce Exchange, New York, were 1,293,121 bbls. as against 1,221,087 bbls. in 1898, and 913,996 bbls, in 1897. This quantity was distributed as follows: to Liverpool, 644,857 bbls; London, 319,869; Glasgow, 211,555 bbls; Hamburg, 72,150 and to various other ports 44,690.

The ports shipping the largest quantities were: New York with 306,889 bbls; Montreal came next with 285,528 bbls; Halifax, 288,318; Boston, 177,660; Portland, 143,892; St. John, N. B., 72,481; Annapolis, U. S., 13,400.

Three were also shipped from New York during the same period 149,515 boxes of California apples, of which 58,922 boxes were exported to Liverpool; 70,724 boxes to London; 13,118 boxes to Glasgow; 4,826 boxes to Hamburg and 925 boxes to Hull.

These boxes are included in the above figures on a basis of 3 boxes to the barrel.

The ports of shipments and distribution with comparisons, are as follows:

## APPLE EXPORTS FOR SEASON 1899-1900.

| DATE. | PORTS OF EXPORT. | | | | | | | PORTS OF IMPORT. | | | | | TOTAL. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | New York | Boston. | Montreal | Portland | Halifax | St. John. | Annapolis. | Liverpool. | London. | Glasgow. | Hamburg. | Various. | |
| 1899 | Barrels. | Barrels. | Barrels. | Barrels | Barrels. | Barrels. | Barrels. | Barrels | Barrels. | Barrels. | Barrels. | Barrels. | Barrels. |
| July 29 | 52 | | | | | | | | | 52 | | | 52 |
| August 5 | 26 | | | | | | | | | 26 | | | 26 |
| August 12 | 324 | | | | | | | 143 | | 181 | | | 324 |
| August 19 | 1,128 | | 60 | | | | | 783 | | 345 | | | 1,128 |
| August 26 | 2,188 | | | | | | | 1,673 | | 515 | | | 2,188 |
| September 2 | 8,321 | 192 | 643 | | | | | 6,255 | 1,119 | 2,801 | | | 9,156 |
| September 9 | 8,961 | 26 | 2,702 | | 2,980 | | | 7,383 | 100 | 4,256 | 25 | | 14,669 |
| September 16 | 9,158 | 26 | 11,537 | | 3,357 | | | 18,297 | 3,005 | 5,408 | 50 | 323 | 24,078 |
| September 23 | 9,062 | 842 | 22,914 | | 11,151 | | | 19,751 | 14,467 | 7,656 | 160 | 4,935 | 46,969 |
| September 30 | 8,795 | 5,849 | 12,747 | | 16,128 | | | 23,433 | 5,400 | 13,249 | 1,113 | 324 | 43,519 |
| October 7 | 19,360 | 6,882 | 38,912 | | 12,488 | | | 35,829 | 13,815 | 23,715 | 4,118 | 165 | 77,642 |
| October 14 | 20,100 | 11,704 | 33,179 | | 24,190 | | | 35,012 | 19,266 | 29,703 | 4,005 | 1,187 | 89,173 |
| October 21 | 27,274 | 10,770 | 52,686 | | 28,000 | | | 54,092 | 22,831 | 29,458 | 6,436 | 5,913 | 118,730 |
| October 28 | 24,363 | 28,328 | 15,109 | | 27,229 | | | 48,593 | 21,063 | 16,050 | 7,443 | 1,880 | 95,029 |
| November 4 | 27,924 | 6,101 | 34,988 | | 11,246 | | | 15,274 | 16,858 | 24,517 | 5,309 | 8,301 | 80,259 |
| November 11 | 17,332 | 18,759 | 33,340 | | 4,849 | | | 41,296 | 5,041 | 7,032 | 11,309 | 9,692 | 74,280 |
| November 18 | 14,631 | 26,285 | 18,459 | | 15,330 | | | 34,609 | 20,285 | 8,500 | 5,329 | 5,983 | 74,706 |
| November 25 | 12,853 | 19,880 | 8,252 | | 12,847 | | 8,000 | 28,640 | 24,167 | 5,553 | 2,218 | 1,254 | 61,832 |
| December 2 | 13,364 | 15,760 | | 16,454 | 850 | 12,000 | | 47,769 | 4,478 | 2,157 | 3,662 | 362 | 58,428 |
| December 9 | 12,021 | 4,632 | | 11,139 | 8,900 | 2,403 | | 22,533 | 11,895 | 2,564 | 1,860 | 243 | 39,095 |
| December 16 | 9,078 | 1,202 | | 6,059 | | 747 | | 6,204 | 1,613 | 8,383 | 822 | 64 | 17,086 |
| December 23 | 3,449 | 2,713 | | 7,177 | | 6,053 | | 10,656 | 6,997 | 652 | 1,088 | | 19,392 |
| December 30 | 5,962 | 3,783 | | 9,364 | 11,300 | 6,967 | 5,400 | 19,341 | 17,921 | 3,536 | 1,035 | 1,043 | 42,876 |
| 1900 | | | | | | | | | | | | | |
| January 6 | 7,052 | 6,687 | | 7,129 | 3,708 | | | 18,240 | 1,868 | 1,841 | 2,627 | | 24,576 |
| January 13 | 3,949 | 4,792 | | 11,756 | 14,300 | | | 19,622 | 12,923 | 1,512 | 439 | 301 | 34,797 |
| January 20 | 2,465 | 523 | | 12,053 | 1,150 | | | 11,431 | 855 | 2,802 | 1,082 | 21 | 16,191 |
| January 27 | 3,220 | | | 8,713 | 14,650 | | | 10,336 | 15,941 | | 306 | | 26,583 |
| February 3 | 5,040 | 593 | | 6,742 | 11,350 | 2,773 | | 8,982 | 12,957 | 1,617 | 618 | 2,324 | 26,489 |
| February 10 | 4,567 | 841 | | 8,736 | 18,019 | | | 15,926 | 10,114 | 5,041 | 943 | 139 | 32,163 |
| February 17 | 3,657 | | | 7,469 | 7,998 | 4,860 | | 15,768 | 7,834 | 253 | 128 | | 23,984 |
| February 24 | 3,313 | | | 7,131 | 1,801 | 3,348 | | 13,840 | 1,459 | 861 | | 36 | 16,196 |
| March 3 | 2,118 | | | 5,446 | | 1,229 | | 7,735 | 858 | | | 200 | 8,793 |
| March 10 | 2,870 | | | 3,944 | | 14,660 | | 6,584 | 14,890 | | | | 21,474 |
| March 17 | 2,459 | | | 5,613 | 1,515 | | | 7,236 | 2,351 | | | | 9,587 |
| March 24 | 2,587 | | | 7,116 | | 14,100 | | 10,201 | 13,602 | | | | 23,803 |
| March 31 | 1,926 | 390 | | 428 | | 2,300 | | 3,486 | 1,558 | | | | 5,044 |

## APPLE EXPORTS FOR SEASON 1899-1900—*Continued.*

| DATE. | PORTS OF EXPORT. | | | | | | | PORTS OF IMPORT. | | | | | TOTAL. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | New York. | Boston. | Montreal | Portland | Halifax. | St. John. | Annapolis. | Liverpool. | London. | Glasgow. | Hamburg. | Various. | |
| 1900 | Barrels. | Barrels. | Barrels. | Barrels. | Barrels. | Barrels | Barrels. | Barrels. | Barrels. | Barrels. | Barrels. | Barrels | Barrels. |
| April 7 | 1,000 | | | 3,989 | 6,200 | 1,041 | | 11,851 | 326 | 119 | 24 | | 12.320 |
| April 14 | 391 | | | 1,737 | 10,152 | | | 2,042 | 10,238 | | | | 12,780 |
| April 21 | 4,458 | | | 47 | 1,800 | | | 2,455 | 2,650 | 1,200 | | | 6,305 |
| April 28 | | | | | 1,587 | | | 1,587 | | | | | 1,587 |
| May 11 | | | | | 243 | | | | 243 | | | | 243 |
| TOTALS | 306,898 | 177,660 | 285,528 | 143,892 | 288,318 | 72,481 | 13,400 | 644,857 | 319,869 | 211,555 | 72,150 | 44,690 | 1,293,121 |
| *Bxs. Cal. | 144,515 | ........... | ........... | ........... | ........... | ........... | ........... | 58,922 | 70,724 | 13,118 | 4,826 | 1,925 | 149,515 |

*NOTE—These figures are included in the above shipments.

## COMPARISON OF SEASONS—1880 TO 1900.

| DATE. | PORTS OF EXPORT. | | | | | | | | | | PORTS OF IMPORT. | | | | | TOTAL. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | New York. | Boston. | Montreal. | Portland. | Halifax and St. John. | Phila. | Balto. | Newp't News. | Norfolk. | Annapolis. | Liverpool. | London. | Glasgow | Hamburg | Various. | |
| 1880-81...... | 599,200 | 510,300 | 145,276 | 39,908 | 24,250 | 9,972 | .......... | .......... | .......... | .......... | 839,444 | 177,936 | 216,391 | .......... | 95,036 | 1,328,806 |
| 1881-82...... | 75,889 | 65,093 | 56,433 | 6,497 | 13,805 | .......... | .......... | .......... | .......... | 21,535 | 133,784 | 46,147 | 59,266 | .......... | 55 | 239,252 |
| 1882-83...... | 169,570 | 102,409 | 64,190 | 16,890 | 18,542 | 3,900 | .......... | .......... | .......... | 19,893 | 253,432 | 46,975 | 81,269 | .......... | 13,318 | 395,594 |
| 1883-84...... | 53,048 | 7,145 | 7,445 | 9,811 | 3,758 | 325 | .......... | .......... | .......... | .......... | 46,661 | 4,843 | 29,685 | .......... | 343 | 81,532 |
| 1884-85...... | 256,314 | 307,130 | 84,487 | 71,460 | 41,207 | .......... | .......... | .......... | .......... | 8,612 | 491,898 | 123,081 | 137,631 | .......... | 16,590 | 769,210 |
| 1885-86...... | 466,203 | 221,724 | 68,716 | 87,301 | 37,982 | 186 | .......... | .......... | .......... | 3,161 | 537,695 | 147,102 | 176,445 | .......... | 24,031 | 885,273 |
| 1886-87...... | 175,595 | 303,179 | 106,713 | 100,569 | 94,606 | .......... | .......... | .......... | .......... | 26,965 | 468,553 | 187,840 | 138,756 | .......... | 12,775 | 807,924 |
| 1887-88...... | 275,696 | 163,916 | 93,058 | 25,215 | 32,652 | .......... | .......... | .......... | .......... | 17,884 | 346,557 | 104,072 | 139,517 | .......... | 18,275 | 608,421 |
| 1888-89...... | 474,337 | 382,199 | 291,307 | 145,825 | 94,691 | 860 | .......... | .......... | .......... | 18,190 | 790,502 | 279,374 | 272,068 | .......... | 64,465 | 1,407,409 |
| 1889-90...... | 169,557 | 132,589 | 162,526 | 122,433 | 53,627 | .......... | .......... | .......... | .......... | 37,030 | 418,850 | 128,248 | 110,449 | .......... | 14,115 | 677,762 |
| 1890-91...... | 76,503 | 23,123 | 182,095 | 80,365 | 89,190 | .......... | .......... | .......... | .......... | .......... | 252,548 | 116,705 | 80,772 | .......... | 1,260 | 451,285 |
| 1891-92...... | 537,247 | 339,964 | 320,457 | 163,145 | 87,379 | 550 | 72 | 1,337 | 215 | .......... | 917,535 | 224,356 | 282,553 | .......... | 25,892 | 1,450,336 |
| 1892-93...... | 218,037 | 204,138 | 429,243 | 235,395 | 116,725 | .......... | .......... | .......... | .......... | .......... | 798,291 | 174,405 | 220,790 | .......... | 10,052 | 1,203,538 |
| 1893-94...... | 29,396 | 4,796 | 56,255 | 49,341 | 35,058 | .......... | .......... | .......... | .......... | .......... | 101,205 | 32,581 | 38,524 | .......... | 2,530 | 174,841 |
| 1894-95...... | 221,398 | 523,123 | 273,353 | 155,878 | 261,410 | .......... | .......... | .......... | .......... | .......... | 853,198 | 388,535 | 173,312 | .......... | 23,110 | 1,438,155 |
| 1895-96...... | 230,705 | 84,771 | 128,027 | 141,955 | 165,797 | .......... | .......... | .......... | .......... | .......... | 410,596 | 196,184 | 127,942 | .......... | 16,533 | 751,255 |
| Boxes...... | 13,610 | .......... | 1,861 | .......... | .......... | .......... | .......... | .......... | .......... | .......... | 11,342 | 2,458 | 1,771 | .......... | .......... | 15,471 |
| 1896-97...... | 570,327 | 1,015,029 | 700,274 | 221,350 | 409,733 | 3,133 | .......... | .......... | .......... | .......... | 1,581,560 | 716,771 | 411,575 | 117,105 | 92,835 | 2,919,846 |
| 1897-98...... | 361,894 | 176,322 | 163,313 | 126,261 | 82,208 | 3,943 | 55 | .......... | .......... | .......... | 490,138 | 198,281 | 123,828 | 88,780 | 12,969 | 913,996 |
| 1898-99...... | 158,213 | 237,395 | 404,573 | 143,892 | 277,014 | .......... | .......... | .......... | .......... | .......... | 689,036 | 271,343 | 180,336 | 22,861 | 57,512 | 1,221,087 |
| 99-1900...... | 306,889 | 177,660 | 285,528 | 148,892 | 360,799 | .......... | .......... | .......... | .......... | 13,400 | 644,857 | 319,869 | 211,555 | 72,150 | 44,690 | 1,293,121 |

Respectfully submitted,

W. F. BROWN.

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# THE POULTRY INDUSTRY OF WEST VIRGINIA.

By H. D. Correll.

In considering the poultry industry of West Virginia as compared with the numerous other lines of business pursuits we may say that it is "Not the biggest but the best." However, in spite of the fact that it does not represent the largest investment of capital it would not be far wrong to say that it is the "biggest" as well as the "best". When hard times have caused other industries to shut down; when poor seasons have burned our pastures and ruined our grain crop; when frost and cold has killed our fruit, the noisy cackle of the industrious hen is heard on every hilltop and echoes through every valley of the state.

Before considering the industry in this State, let us glance for a moment at the poultry interest of the United States in order to gain some conception of its magnitude. Possibly the best presentation of the subject is the following from the Rural New Yorker: "In 1890 there were in this country 258,871,125 chickens and 26,738,315 other fowls, such as turkeys, geese and ducks. The average value of the chickens was 30 cents each. and of the other fowls 75 cents each. The American hen layed in that year 819,722,916 dozens of eggs, with an average export value of about 15 cents a dozen. If the increase in the past six years has been at all proportionate with the increase between 1880 and 1890, there were, in 1896, 350,000,000 chickens and 35,000,000 other fowls, and the hens layed 1,100,000,000 dozens of eggs. We estimate the value of these at $165,000,000, and of poultry sold as meat, $125,000,000 more, or a total of $290,000,000. Here, then, is the statement:

| | |
|---|---|
| Value of silver produced 1895 | $72,510,000 |
| Value of gold produced 1895 | 46,610,000 |
| Value of wool clip | 38,146,459 |
| Value of all sheep | 65,167,725 |
| Or a total of | $222,434,184 |
| Earnings of poultry | $290,000,000 |

Or, if we were to put it in another way, it might be said that the American poultry produced enough in one year to buy all the silver and gold that were dug out of the mines, all the sheep in the country, and all the wool they made, and, in addition, the total crop for the year of buckwheat, rye, barley and potatoes. This year's earnings of poultry would have bought all the milch cows in the country, which were valued at $263,955,545. The total value of all the minerals mined in this country in 1894, including iron, gold and silver was $218,168,788. The total coal produced that year was valued at $166,280,472, or about the same as the egg crop alone of last year. The total state and county taxes for the entire union in 1890 were $143,186,-007, so that the hens earned enough to pay the entire state and county taxes, with $150,000,000 left to pay for the tobacco crop, the potato crop, the rye ceop, and half a dozen other crops thrown in.

It will thus be seen that the American hen is giving an excellent account of herself. For, when we come to examine the above figures, we shall find that she takes no mean place among the producers of the country. Long live the American hen! May her cackle never grow less! May her comb grow red with prosperity, and may her eggs roll the mortgage away from many a farm!

What is true of the United States as a whole is also true of West Virginia. In the year 1898 the value of West Virginia poultry and eggs sold was $2,932,198, or five per cent. more than the value of all the sheep; 65 per cent. more than the value of all the swine: enough to purchase five times all the commercial fertilizers used, or nine per cent. more than the value of the entire yield of oats, rye, buckwheat and potatoes. No field crop, with the exception of wheat, corn and hay, equaled in value the poultry product. The total amount of taxes collected in the state was $1,131,331, which the poultry product would pay twice and have enough left to buy all the sheep left over one year old in the state. The value of the egg production alone was more than twice enough to support the State University, normal schools, asylums and penal institutions.

In the year 1898 the value of the poultry product in Wood county alone was over $120,000, and that of Kanawha over $100,000. During the same year the estimated value of the egg production in Wood county was $62,835, and that of Jackson $45,600. By way of comparison, it is interesting to note that in the county of Wood the total value of all sheep and swine was only $90,000, the product of which was much less. In Kanawha county the same contrast is evident, the sheep and swine being valued at $95,000, and the poultry product at $100,000. The sheep and swine represent a large capital invested. The poultry represents a small capital, divided among all classes and the most productive of all investments. The people of Greenbrier county have $40,000 taxable capital invested in sheep and swine and from this they cannot realize a return above the amount invested. In the same county they own 130,000 chickens, worth about $26,000, and from these is received a product worth $75,000, or three times the amount invested. So much for statistical information, which, inacurate as it may be in many cases, serves to show the relative importance of different lines of industry.

## VARIETIES OF CHICKENS.

There are so many breeds of chickens that to give a detailed description of them all would take many pages. There are certain breeds that are suited to West Virginia conditions and are consequently most popular among the farmers and fanciers. The six varieties that, in our estimation, are most worthy of notice are herewith described and illustrated, the cuts being supplied through the courtesy of the Director of the West Virginia Experiment Station.

### BARRED PLYMOUTH ROCKS.

The Plymouth Rock is undoubtedly the most popular breed of poultry in West Virginia, and indeed we may say in the United States also. This popularity is due to the fact that as A GENERAL purpose fowl it is unexcelled, and being one of the oldest American breeds and having secured a firm hold upon

BARRED PLYMOUTH ROCKS.

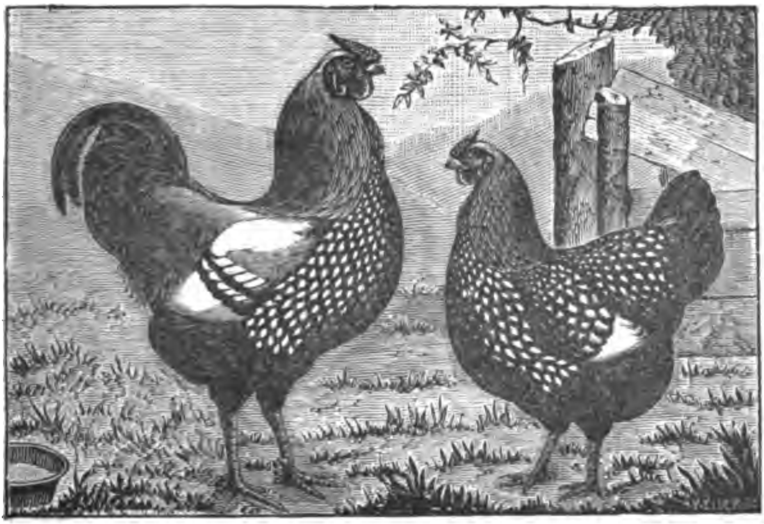
the favor of both farmer and fancier, through its numerous traits of excellence, continues to stand high in public favor. The barred variety, which originated twenty-five years ago from a cross of the American Dominique and Black Java, is the best known and most generally raised. As a fancy fowl this variety is one of the hardest to breed, requiring skill and experience to make matings that will prodnce birds of standard requirements. For this reason the white Plymouth Rocks have, in many cases, succeeded the barred.

The size of the Plymouth Rock is rather above the average, cocks weighing 9½ lbs. and hens 7½. The legs and skin are yellow and the breast full and plump. A single comb is most common but a peacomb variety is also raised to quite a large extent. The breed is hardy, enduring either extreme heat or cold. The young are easily raised and make admirable market birds. As layers they are not equal to the Leghorns but stand very close to them. As sitters and mothers they are excellent.

No fowl is so universally sought after by both fanciers and those producing market stock. The difficulty in breeding high scoring specimens seems to lend enchantment to the work. A double mating, or in other words using a standard color male with medium dark females to produce cockerels and a light male with dark females to produce pullets, is practiced when best results are wanted. However a single mating may result in the production of fine specimens but not with the same degree of certainty.

### WYANDOTTES.

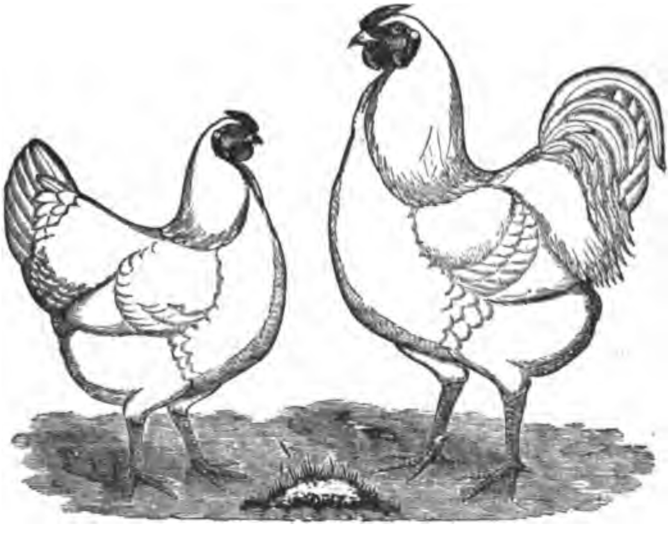
The Plymouth Rocks have no closer rivals as general purpose



GOLDEN WYANDOTTES.

fowls than the Wyandottes. They are not so generally distributed in West Virginia, but the indications are that they are becoming more and more popular. In size they are not quite so large as the Rocks, yet in laying qualities are easily their equals and in hardness and as mothers are claimed to be somewhat superior. The writer has noticed that no other breed coming under his observation possesses such a degree of maternal instinct.

The Silver-Laced Wyandottes, like the Barred Rocks, are rather hard to breed to standard requirements, the tendency being to become too dark. To avoid this it is well to use for breeding those fowls which are somewhat lighter than called for in the standard. This is proof of the fact that prize-winning hens do not necessarily produce prize winners.



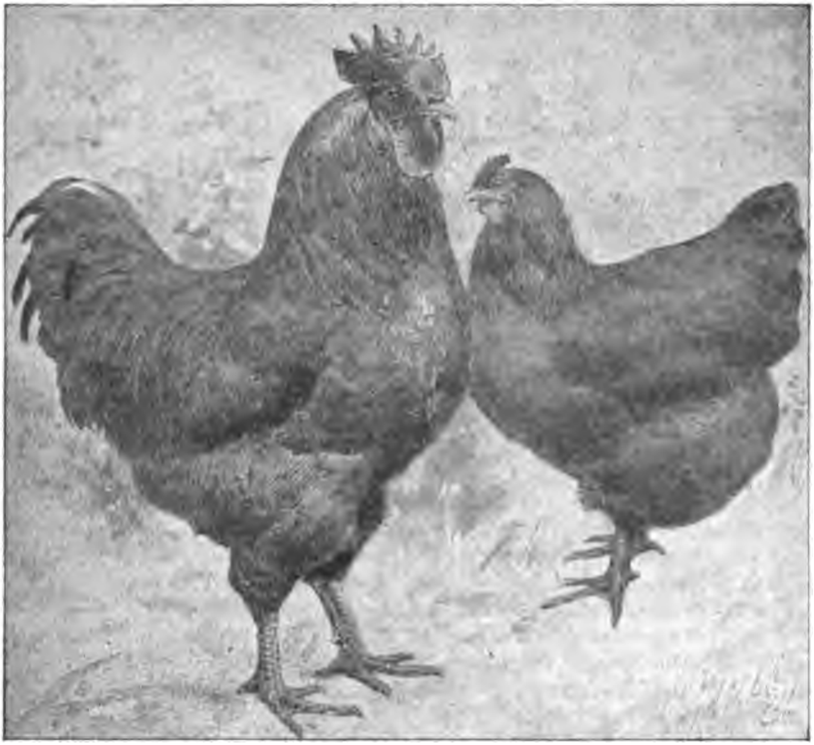
WHITE WYANDOTTES.

The solid colored Wyandottes—white, black and buff—while possessing about the same characteristics as the Silver and Golden Laced, are in point of color not so hard to breed to perfection. In the selection of silver-laced females care must be taken that the breast feathers have large and distinct lacing, the centers free from dark lacing.

As table birds the Wyandottes are very superior, the bodies being large and plump, with full juicy breasts. For broilers they are in high favor and a cross with the Indian game, gives us the ideal bird for the early spring market.

### RHODE ISLAND REDS.

Among the very newest of our breeds are the R. I. Reds which originated along the shores of Narragansett Bay and take their name from the State of their nativity. An excellent description of this breed is given by our young friend and fancier, K. C. Atkeson, as follows:



RHODE ISLAND REDS.

"Rhode Island Red fowls first attracted attention by their handsome buff color and fine appearance, but later they became favorites among poultry men on account of their many good qualities. They were formerly a buff colored breed, but later have bred up to a dark reddish brown color. The cocks are somewhat darker than the hens. They have short stout legs, and a well developed keel (breast), which gives them a fine appearance. They are good layers of large dark brown eggs. The eggs produced by this breed seem to hatch better and produce stronger chicks than those of most breeds.

The young chicks are very hardy and will thrive under fairly good conditions. Last season I found that young chickens of their breed were easier to raise than any other breed common in West Virginia. In a Victor brooder I placed 72 chickens, 34 of which were Rhode Island Reds and the remaining 38 were white and brown Leghorn, Brahmas, Langshans, and Plymouth Rocks. The chickens were kept in the brooder for five weeks. They were not confined closely but allowed to run a short distance from the brooder, on warm sunshiny days, to get exercise. When the chicks were removed to a coop which was placed where the brooder had been, we found thut all of the Rhode Island Reds were alive with the exception of two; which were killed by an accident, while only about 30 per cent. of the other chicks were alive.

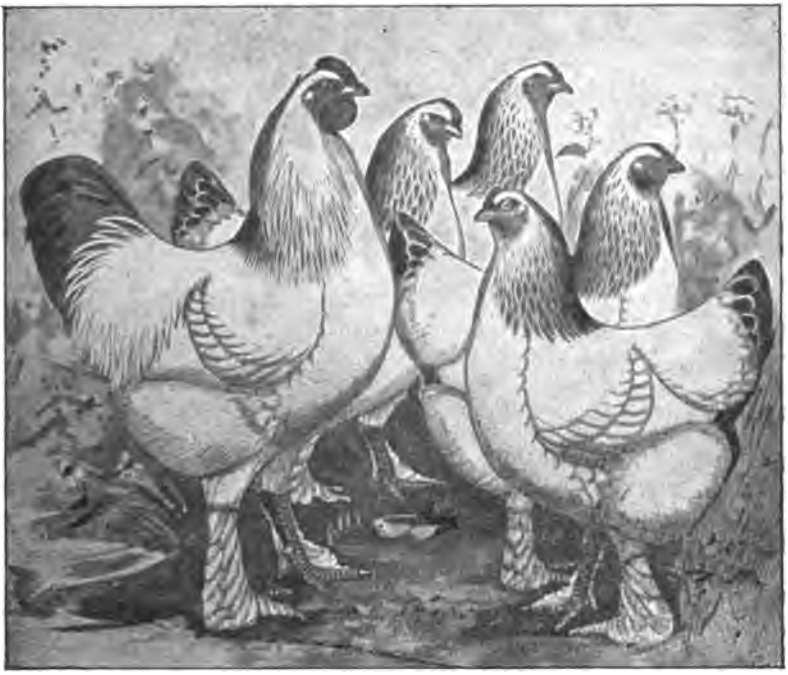
They were not only hardy in the brooder but in the coop and lastly, but not leastly in the poultry houses, where they were placed when eleven weeks old. The young Rhode Island Reds weigh about two pounds when they are eight or nine weeks old. They make fine broilers, for at that age, they have a plump appearance and have very few small feathers—pin feathers—which makes them easy to dress for the market. They are very desirable market fowls on account of their rich yellow skin and their fine plump appearance when dressed.

A two-year old hen weighs 7 to 9 pounds. They are a fine fowl lor table use, and always command good prices in the market. Rhode Island Reds are good foragers, and do not get as fat as most heavy breeds. They have been called a general purpose breed, and they are a typical farmer's fowl on account of their hardiness, size and good laying qualities. They have gained disfavor to some extent because of unprincipled men selling any kind of buff colored fowls they chanced to have on hand, for a purebred Rhode Island Red, and some people began to think that because they had been cheated, that all Rhode Island Reds were mongrels."

In Bulletin 45 of the West Virginia Experiment Station, Dr. Myers says: "As a table fowl and as a producer of eggs the Rhode Island Red has much to commend it. In fact, it is one of the most satisfactory breeds of chickens we have on the Agricultural Experiment Station grounds."

### LIGHT BRAHMAS.

We shall mention the Light Brahmas only, since they are more popular and generally disseminated than the Dark Brahmas. These chickens are of Asiatic origin and the same that caused the "hen fever" of the '50s. They are the largest of all the breeds of chickens, cocks weighing 12 pounds and hens 9½.



LIGHT BRAHMAS.

A more beautiful sight is seldom seen about a poultry establishment than a flock of Light Brahmas, majestic in their appearance, stately in their build and moving about with a proud step. For winter layers they are unexcelled and with proper care will lay the year round. They are rather heavy for setting but if reduced in flesh do very well. One objection is that they, like the Indian Games, are exceptionally broody, being very hard to "break up" when once determined to set. They are heavy feeders, and not being inclined to take much exercise, some incentive must be used to promote exercise and prevent excessive accumulation of fat. All Brahmas are easily enclosed by a four-foot fence. This being especially suitable for towns where a high fence would be both expensive and objectionable.

The following, taken from a paper by J. T. Garrett, Esq., of Hurricane, W. Va., is interesting:

The Light Brahma is classed as a purely "Asiatic" chicken, and are especially adapted to cold climates, as they are so well feathered even to the ends of their toes and have such small combs (which is always pea-shaped) that they never suffer from frosted combs or whattles.

The first Light Brahmas that we have any account of in America were procured by a Mr. Chamberlain, of Connecticut, in 1847, through a Mr. Knox, who found them on board a ship in New York harbor. This lot came from India.

Captains of ships had chickens put on board to eat on their journey, and the coops were used for life preservers in case of accident, and it is possible that this captain had a few left, which caught the attention of Mr. Knox, who seized and sold them for breeders.

The name "Brahma" means "Divine Essence," and was given to the sacred river, "Brahmapusia," which is 1,400 miles long and flows into the Bay of Bengal.

This *fowell* derived its name from the river and were first called "Brahmapusia," or "Slant-Legged Chitlagous."

About 1855 to 1860 they found their way to the fanciers show, who soon clipped their name down to "Brahma."

Up to this time both single and pea combs were bred.

The Malays bred exclusively the pea comb, and it is to their influence that we attribute the pea comb.

The finely, well-bred Light Brahma is a beautiful bird to behold. The male should weigh 12 pounds, the hen 9½, which is one-third heavier than any other standard breed. Their color is a clear *white*, with feathers of neck hackle, black center and edged with white; the large wing and tail feathers should be solid black, or streaked with black.

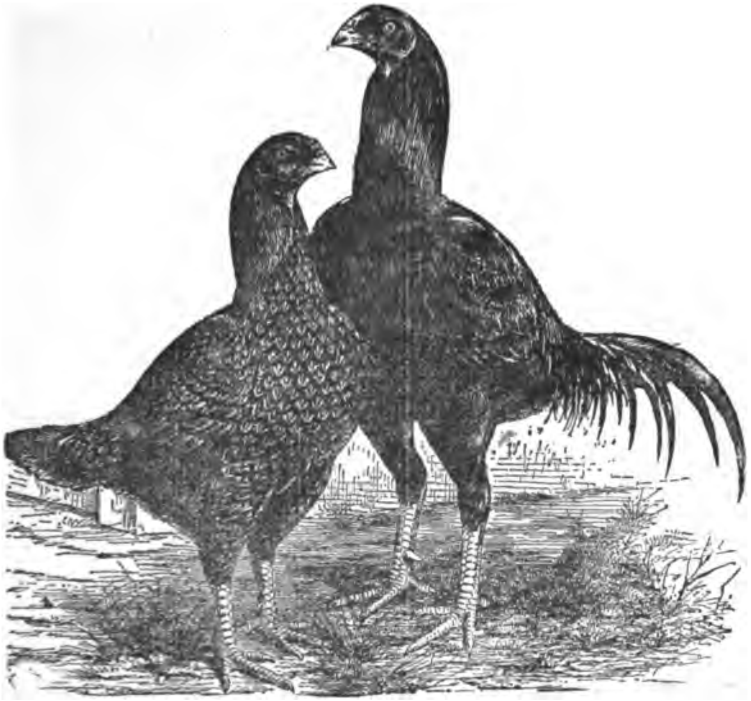
Brahmas are used extensively by poultrymen, who wish to produce broilers for the market, being of very rapid growth, they are especially adapted for the purpose.

## INDIAN GAMES.

Among the leading breeds of poultry none have risen in public favor more rapidly or won a more deserved reputation. The Indian Games are classed as general-purpose fowls, however their especial point of merit is the excellent quality of meat and large-sized bodies. The average weight of cocks is 11 pounds and hens 10. In this respect and in their docility they differ from the other game chickens, although they have the proud, erect carriage, bright eyes and close-fitting feathers, common to the class.

No other breed is so well adapted to crossing on mongrel breeds for their general improvement or upon pure breeds for the production of broilers. When bred pure it is noticed that the young are susceptible to disease, resulting from dampness, but the cross-breeds show no propensities in this direction and are the hardiest chicks that can be produced. If one wishes to improve his flock of common barn-yard fowls, let him invest in Indiam Game cocks and he will be surprised at the results. The hens are rather persistent sitters and make excellent mothers.

Their peaceful disposition renders their name a misnomer in the opinion of many people, but we must remember that the word "game" does not necessarily signify a pit fowl. To call them Indians, as has been proposed, would be wrong, since they have all the true game characteristics.



CORNISH INDIAN GAMES.

Dr. Myres has this to say of them in Bulletin 45: "The Indian game mothers hatched more eggs and raised more chicks than any other breed upon the farm, and we shall in the future employ them quite largely there for this purpose. I cheerfully commend them to persons wishing an excellent breed of chickens. Care must, however, be exercised to keep them in clean houses, as they are more susceptible to roup or diphtheria than any other breed with which we are acquainted." While what Dr. Myres says may be true in his case it is extremely doubtful if they are as a general thing such good fowls for hatching, their feathers being so compact that it is a hard matter for them to cover eggs as they should be. They are no longer kept on the experiment farm.

## LEGHORNS.

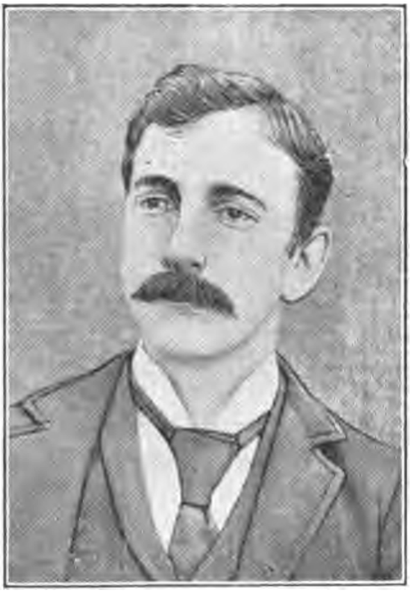
These are the great egg machines and although probably not superior to the Hamburgs or Minorcas are more generally bred in West Virginia. There are the white, brown, black, dominique, silver duckwing and buff varieties with both rose and single combs. After thorough study and some experimenting it is our opinion that the rose comb brown is the most suitable of all the Leghorns for West Virginia conditions. Since this state is subject to severe cold in winter it is almost impossible and very expensive to build houses warm enough to prevent the single combed varieties from freezing their combs. A hen with a frozen comb is rendered much less valuable as her egg laying capacity is lessened fifty per cent. The trouble is avoided by breeding the rose combed varieties. Being non-sitters, great foragers, active and alert, it is to be seen that the Leghorns are pre-eminently egg producers, although not large enough for a market fowl, their compact bodies and excellent

SINGLE COMB BROWN LEGHORNS.

quality of meat are recognized. It has been a pretty generally accepted conclusion that profit in poultry is first from eggs and since this class easily produces, under favorable conditions, 200 eggs a year, we cannot but arrive at the conclusion that for profit raise Leghorns. Since 1834 when a vessel from Italy brought the first Leghorns to this country they have continued to hold the leading place among the non-sitters and it does not seem that they will soon loose their well deserved reputation.

## SOME PROMINENT BREEDERS.

The importance of the poultry industry in our State may be measured, in a manner, by the business done in the way of raising pure-bred stock by the more prominent breeders and fanciers. It is easy to be seen that we are not a par by any means with our neighboring states in this line. Our farmers have for years been sending to Ohio and Pennsylvania and Virginia and Kentucky for pure-bred stock, in many cases not knowing that



MILTON H. TAYLOR, OF MASONTOWN, W. VA.

it could be obtained in West Virginia or if they knew feared that the breeding was not up to the standard. We have now reached the point where there is no excuse for going elsewhere for fine stock and it is to be hoped that West Virginians will henceforth patronize home industry.

An effort was made to secure a brief description of the various poultry establishments in the State. While it has been impossible to get adequate information concerning all, the following, culled from our correspondence, is given. Those whose yards receive no notice may attribute the same either to our inability to find them out or their failure to reply to solicitations for information.

D. P. L'MASTER.

One of the most progressive poultrymen of the State is Milton H. Taylor, located at Masontown, Preston County. In a letter Mr. Taylor says: "About 1890 I began to cast about me to see how people made their money and to see why my money came in such small sums and so far between. I discovered that all our stock was scrub stock, that it was small and ill formed as to beauty and market requirements, hence the meagre price." After reciting some experience in the improvement of his stock he continues, "I have been breeding Mammouth Bronze Turkeys for several years, generally keeping five or six old fowls and a fine large cock. I have been breeding Barred Plymouth Rock chickens, also, for several years. I began with B. P. Rocks, Black Minorcas and S. C. Brown Leghorns but I soon found that I had no sale to amount to anything from any but the B. P. Rocks and I at once discarded the others and became an "exclusive" man. I usually have 50 to 100 breeders but at this time I have them cut down to 25. I usually raise 200 to 300 chicks but have cut that down somewhat. I have one yard of my very choicest specimens headed by a $10 E. B. Thompson cock."

Mr. Taylor deals also in pure-bred cattle, sheep and swine. in spite of the popular belief that Preston county raises nothing to perfection except buckwheat and potatoes, a glance at Mr. Taylor's poultry and fine stock will convince the most skeptical that the fertile plains of the vast West can not do better.

In the eastern part of the State Mr. D. P. LeMaster, of near Martinsburg, has established an enviable reputation with Barred Plymoth Rocks. He has been successfully engaged in the business for several years and also raises Shropshire sheep and Poland China hogs, but says that his "chickens beat everything in their yearly yield." From the 1st of April 1900 to June 14 he has sold in round number eggs for hatching to the number of 2,500 and also large numbers of fowls at $1 each. Since he raises Barred Plymouth Rocks exclusively, they have free range, which always insures the health and vigor of the stock and the fertility of the eggs. Besides supplying his large custom with breeding stock, he does an extensive business in fowls and eggs for the market.

J. T. GARRETT.

No one in West Virginia is more zealous in his work than J. T. Garrett, of Hurricane, Putnam county. He breeds Barred Plymouth Rocks, Light Brahmas, White Plymouth Rocks and

Bronze Turkeys. His stock is direct from the famous J. W. Miller and Sid Conger yards and will bear the closest inspection. In regard to egg production he has this to say:

"I sold a Light Brahma hen to a farmer who kept a record of her eggs from March to March, which numbered 219. I find my Brahmas better layers than my Rocks, and of much larger, smoother eggs, but I could not think of dispensing with my barred pits."

In a carefully-kept record he reports 12 Barred Plymouth Rock hens as laying 552 eggs in six months, and in the same length of time 18 Light Brahmas layed 1,072, or a difference of nearly 30 per cent. in favor of the latter. A statement of Mr. Garrett's business for six months ending July 1st, 1900, shows a clear gain of $123.35 on an investment of $100. In connection with his poultry business he is engaged in raising Belgian hares, and has a very fine lot of stock, from which he has already realized a handsome profit, although he has been in the business less than a year. Give us more men with the energy and enthusiasm of Mr. Garrett, and the poultry interests of our State will be wonderfully advanced.

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J. M. CORRELL.

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## DAISY HILL POULTRY YARDS.

The proprietor of the above-named yards, Mr. J. M. Correll, situated near Lewisburg, Greenbrier county, in the year 1894, purchased from Dalbey Brothers, of Washington Court House, Ohio, a sitting of Silver-Laced Hamburg eggs. This was the beginning of an enterprise which has grown in the last six years to be one of the leading pure-bred poultry yards in the State. Like all breeders, he has met with many reverses, and having to learn much by experience tried many breeds and devices before reaching any settled conclusions. The Hamburgs being the first breed used were thoroughly tested for four years, and although a new breed in that section and one which excited much interest by their beauty, it seemed that a larger fowl could be sold to better advantage, and accordingly an investment was made in Light Brahmas. Still the missing link was not supplied. White Leghorns and Black Breasted Red Games were given a trial, but the popular desire was not yet reached. The next move was in the purchase of those two noble American breeds, Barred Plymouth Rocks and Silver-Laced Wyandottes, and in the past three years he has sold more stock and eggs from these two breeds than from all others combined. In addition to these and close rivals to them in popularity, he keeps Indian Games and Rose-Comb Brown Leghorns. Bronze Turkeys and Pekin Ducks complete the list of poultry at Daisy Hill Farm.

In the short time Mr. Correll has been in the business he sold eggs and fowls in all parts of the State and has also made many sales in the adjoining States, as well as Michigan, Illinois, Tennessee, Georgia, New York and others. He has a magnificent location, large runs and comfortable though not costly houses. His Bronze Turkeys, of which he is especially proud, have the advantage of free range, which is so necessary for the full development of these noble birds.

## WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION FARM.

For a number of years the poultry on the experiment farm has been given a very prominent place. Almost all breeds have been tried and their relative merits tested. Results of the various experiments have been reported from time to time in the farm papers and in the bulletins that have been issued. In the year 1896, Dr. Myers published Bulleting No. 45, giving a detailed description of the various breeds, rules for judging, notes on feeding and marketing, etc. In all a very complete bulletin. Since then, a new farm having been purchased, the poultry has been given in place of its former damp quarters on a nothern hillside, a fine location, modern houses and every convenience necessary for success. Among other investigations a number of incubators have been tested and while no one machine has been pronounced superior it was certainly demonstrated by Dr. Myers that a machine holding several hundred dozen of eggs which he built in the cellar of the experiment station was a failure. There have also been some very careful experiments in feeding carried on and the result of these and others is set forth in Bulletin No. 60—"Poultry Experiments."

The breeds now raised are Barred Plymouth Rocks, Leghorns, Light Brahmas and R. I. Reds. The R. I. Reds are given a prominent place and are considered to be one of the very best breeds of chickens for West Virginia.

Prof. Horace Atwood who has charge of the poultry is an enthusiastic fancier. He has been exceptionally successful with artificial incubation and is constantly at work with valuable experiments along this line, the result of which will, in due time, be given to the public. The work of the Station is doing much to advance the poultry interests of the State; to bring about improvement of breeds and stimulate a greater appreciation among the farmers for the importance of the poultry business.

### S. L. DODD.

The above named gentleman, situated at Little Georgetown, in the county of Berkeley, is among our most up-to-date breeders and modestly refers to his business as follows:

"We have been interested in pure-bred poultry for about ten years, but with no idea of an extended production in that line. We are now, however, preparing to do the work more in accordance with approved plans than before. We keep only pure stock. From about seventy-five hens, Barred Plymouth Rocks, and three white Holland turkey hens we sold this spring about $100 worth of eggs, chickens and turkeys, besides supplying a family of ten with eggs and chickens."

Mrs. Dodd is also a fancier and, like the wives of most breeders, is a very important member of the firm.

### E. A. BRONAUGH.

Mr. Bronaugh lives near Buffalo, in Putnam county, and, though not extensively engaged in the poultry business, he has given it considerable attention from a practical standpoint. He formerly bred Barred Plymouth Rocks and Brown Leghorns but after having carefully kept a record of the profits derived from each breed, came to the conclusion that it is more profitable to raise Plymouth Rocks than Leghorns, since in his case they laid more eggs, especially when eggs were in demand and were more valuable as market fowls. Mr. Bronaugh keeps in his breeding yards 100 hens and raises annually between 200 and 300 pure-bred Plymouth Rocks from which he realizes a very substantial return.

### OTHER BREEDERS.

There is a large number of breeders in the State, many of whose names we have been unable to learn and others whose names only we have been able to secure. The following list is therefore given:

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|---|---|---|
| Sprague Bishop | Martinsburg | Berkeley County. |
| McKeney Brothers | St. Albans | Kanawha County. |
| D. E. Baird | Charleston | Kanawha County. |
| A. D. Wood | Moorefield | Hardy County. |
| Wm. R. Dotson | Lewisburg | Greenbrier County. |
| J. D. Riggs | Josiah | Pleasants County. |
| W. H. Pyles | Hebron | Pleasants County. |
| Isam I. Beasley | Villa | Kanawha County. |
| L. L. Burdett | Hurricane | Putnam County. |
| Harvey Handley | Lewisburg | Greenbrier County. |
| J. J. Henderson | Hurricane | Putnam County. |
| Harvey Hern | Hurricane | Putnam County, |
| O. G. Elliott | Hurricane | Putnam County. |
| Loyd Taylor | Hurricane | Putnam County, |
| Mrs. M. C. Burnside | Freemansburg | Lewis County. |
| E. O. Taylor | Berlin | Lewis County. |
| Albert Behrens | Sherrard | Marshall County. |
| Dennis Williams | Sherrard | Marshall County. |

The many other names which should be on this list we hope to be able to get together at some future time.

This brief review of the poultry industry of West Virginia can only serve as a prelude to the business as it will some day become. Before that point is reached, however, the poultry fraternity of the State must organize in order to do more effective work. Just as there is a Horticultural Association or a Wool Growers' Association, there must be a Poultry Association organized and shows held. In this way the breeders will come in contact with each other and with the people of the State, and in so doing build up the industry. How soon this may be brought about depends on the amount of enthusiasm that exists among the breeders, as well as the number of breeders. Let us keep step with our neighboring States. As we point with pride to our coal and oil and timber, which furnish a rich harvest for foreign capital, let us also remember the faithful hen, which no monopoly can control; which labors as diligently for the poor as for the rich; whose cackle is as the jingle of dimes and dollars. Long live the faithful hen!

# THE HONEY BEE.

By G. G. Naylor, Apiarist, Lockhart, W. Va.

Strictly speaking, the Honey Bee family includes quite a number of different species, such as the bumble-bee (Bombus) the stingless bee of the American tropics (Melipona), the tiny East India honey-bee(Apis Florea) etc.; but it is not our purpose to dwell at length upon any of the species, excepting hive bee (Apis Mellifica), of which there are several families, including the German or Brown bee, Italians, Egyptians, Cyprians, Syrians, Holy Lands, and Tunisians. The German or Brown bee was the first to be introduced to this country, having been imported from Europe some time in the seventeenth century, and is now pretty well spread over our continent, both in a wild and in a domestic state. It is in the majority at the present time in West Virginia, although being rapidly superseded by advanced bee-keepers by the Italian, which is now concded by a vast majority of our best informed Apiarists to be much superior in several particulars. Perhaps the greatest superiority is shown in their great energy exibited in gathering nectar from flowers, which the Germans think not worth bothering with. Their greater energy and strength is also shown in defending their homes against robbers, moths and other intruders. The Italians as a rule are much more gentle and more easily manipulated than the Germans (or Blacks), and while the latter will seem much excited as a frame is being lifted from the hive, running down and clustering and hanging from the lower side of the frame, or diving into the cells and gorging themselves with honey, the former will work away contentedly as though nothing unusual was happening. The Blacks very frequently attack persons and animals at a distance from their hives, but the Italians rarely do. Although the Italians are vindictive enough, stinging with a vengeance, when thoroughly aroused, they need not as a rule be aroused with careful treatment, such as every Apiarist should learn very easily in his experience with bees.

The Italians, as their name indicates, are natives of Italy, and were first imported to this country in 1860 by the Department of Agriculture and have steadily increased in popularity ever since then until now they are generally conceded to be without a peer.

We believe all the other named species of hive bees (Apis Mellifica) have been imported to this countey during the last twenty or twenty-five years, and each, for a time, have had their advocates, and perhaps each has some desirable qualities, but they *come and go*, while the Italians *stay*.

## GIANT EAST INDIA BEE.

Before passing the different races of bees, perhaps we should mention the Giant East India Bee (Apis Dorsata), of which comparatively little is known in this country, although several attempts have been made in the last twenty years to domesticate and bring it to the United States. The first effort, we believe, was made by Frank Benton, who has traveled so much in the bee interest, and has done so much to advance the Apiarian business, especially in bringing forward the merits of the different races of bees, and who is now at the head of the Apiarian division of the Department of Agriculture, at Washington. He visited India in 1880 and 1881 for the purpose of obtaing colonies of Apis Dorsata, and no doubt would have succeeded in bringing them to the United States but for a severe illness which he contracted in India. Although he failed in the main object of his visit, he succeeded in clearing up mysteries and doubts concerning them, which is very encouraging to those who hope that they may still prove very profitable to the Apiarian industry, either by domestication in a pure state or by crossing them with some of our domestic races. They are called Giant Bees on account of their size, the workers being near the size of an Italian Queen. So it it hoped they have longer tongues than our domestic bees, and may thus be enabled to gather honey from flowers whose cells are too deep for them, especially red clover, which is known to secrete abundant nectar which can not be utilized because our bees' tongues are too short. But this is an age of wonderful advancement and improvement, and the writer has but little doubt that the time will soon come when, either through the importation of Apis Dorsata or the breeding for larger tongues in our domestic races, we may be enabled to reap this rich harvest of sweets, which now by the ton goes to waste from year to year. Some may smile at the thought of breeding bees with longer tongues, and we will admit that such an undertaking might not be advisable with the *human race*; but with bees it is different. We see no reason why bees can not be bred for length of tongues as well as cattle for length of horns, or hogs for length or shortness of snout or ears. This question is now being agitated by some of our most advanced bee keepers, and not only this, but it is proposed to work from both ends of this theory. While we breed for longer tongues for our bees, we should also aim by selection to produce red clover with shorter cells or cups.

## KIND OF BEES COMPOSING A COLONY.

A colony of bees in good condition at the opening of the season, should contain from 30,000 to 40,000 workers, besides four, five or more frames of brood in all stages of development, from the tiny egg to the mature bee just gnawing off her cell door and coming forth into the light of the busy home. The next in point of numbers in the hive are generally the drones or male bees, whose only known use is the impregnation of the Queen, which is accomplished as she is on her "wedding flight," as it is called, as they meet in the air. The dones come from an unfertile egg deposited in a larger cell than those of the workers. Their production should be limited mainly to colonies of select stock possessing the qualities one wishes to breed for. The next and most important personage in the colony is "Her Majesty," the Queen, mother of all the rest. She comes from a fertizized egg just the same as those which produce a worker. The difference is produced by an enlargement of her cell and feeding richer food called "Royal Jelly." As a rule only one Queen is allowed to live in a hive, although at times when the Queen is failing from age or some other cause, a daughter is produced and allowed to lay her eggs side by side with "Her Majesty." While the drone requires twenty-four days to mature, from the time the eggs are laid, and the worker twenty-one, the Queen, perhaps by reason of her rich food, comes forth in from fifteen and one-half to sixteen days.

## THE BEE KEEPER.

Although it may be possible for almost anybody to keep bees, there is a vast difference between simply keeping bees and being a successful beekeeper. Bee-keepers—at least to some extent—are, like poets, "born and not made". That is, certain men and women seem naturally to possess certain qualities which especially fit them for the business, while others are deficient in these qualities. The first and most important requisite I would mention is a *liking for the business.* We not only do the best and succeed the best in a business we like, but we take a deep interest in it and our work is a constant pleasure and satisfaction. While work in which we are not interested, becomes drudgery. The writer remembers with what delight in boyhood days at the old homestead, he used to sit near the old box hive and watch the busy workers pass in and out with their loads of pollen and honey. And, in later years, although annoyances and losses have come, as they must come in any line of business, we find much pleasure and profit in working for our little pets. Cool headedness, patience and firmness are all very necessary qualities for a bee-keeper. He is almost sure to get into situations once in a while which requires all these qualities combined, and it does not do for him to make an ignominious retreat, or get excited and begin to "jerk things around" as his feelings might prompt him to do, as this causes the little soldiers to use their lances with all the vim imaginable. Cowardice or excited action would only make a bad matter *worse*. Every movement should be slow and careful. And this brings us to another very necessary quality in a bee-keeper, viz: *Carefulness*. We need it not only in the manipulation of hives, frames, cases, etc., during the honey and swarming season, but we need to be careful that each colony is in good condition as to stores and strength as well as protection from the winter's cold before the cold comes. Then in the early spring we need to be careful, which is the most trying time for bees, and see that each colony has a laying Queen and sufficient force of workers to cover, care for and protect the young brood in which we have our future hope of profit. I do not wish to intimate that there is a scarcity of men or women either who might make good bee-keepers; but they must have a love for the bees and the business, and the necessary qualities will develop by use. The sting loses much of its terror as one gets accustomed to it, partly because we bear anything with better grace after getting used to it, and partly because as one becomes inoculated with the poison it becomes less painful.

## BEE KEEPING.

As we began to study bee-keeping as a business, the question arises, Is it profitable? Can it be made profitable? Like most any other business, the answer would depend on the man, the situation, the market, etc. In speaking of situation, I do not mean the particular lay of the land, as we think that makes but little difference, but we mean with reference to the flora from which one expects his profits to come. The writer has found the business as profitable here in Jackson county as any other branch of his farm work, which consists in stock raising, fruit culture and general farming. It certainly ought to pay when the bees "work for nothing and board themselves", as some are wont to remark. This may be true for some who *keep bees*, simply, but it is not always true with an intelligent bee-keeper, even after the hives and other fixtures are provided. There are times when dimes spent for feed to prepare for winter, or in the spring to stimulate brood-rearing, will bring dollars to the pocket. There is another source of profit which is not generally taken into consideration when counting the profits of apiculture, viz: the benefits to fruit culture in the cross pollenation of fruit bloom, of which we will speak farther on. We think there is but little doubt that bee culture might be increased many fold in West Virginia, with great profit to individuals, and add very materially to the wealth of the State. We do not think it would be wise for every farmer—or tradesman—to keep bees. Those who do not care for them properly, just simply keep them, not only fail to deserve any profit themselves, but they make a great drawback for those who wish to keep the improved stock. The most carefully-bred virgin Queen is liable to mate with a drone from very inferior stock in the hive of a careless neighbor.

## HIVES AND OTHER FIXTURES.

As a rule, we would advise all who are going to continue to keep bees in a "gum" or "old box hive" to quit just as quickly as possible. On the other hand, do not let some sleek-tongued agent get you interested in some patent moth-trap, bee-palace, or any other complicated "clap-trap". The kinds and styles of patent hives which have been constructed are known by the name of legion. While an individual bee-keeper would succeed with most any styly of frame-hive, it is wise for beginners to profit by the experience of those who have been successful. Simplicity and completeness are important in the construction of every part of the hive and its fixtures. We think there is no better hive than the dove-tailed hive manufactured and sold by A. I. Root & Company, Medina, Ohio, with 8 or 10 frames 17⅝ inches long by 9⅛ inches in depth. Any ordinary workman can make the hive at home as the material is shipped in flats ready to put together, by leaving off the dove-tail and making a simple box by nailing the corners together. Of course, the frames, sections, sections, section-holders, etc., can be bought from the factory much cheaper and more perfect than they could be made by hand.

Every bee-keeper should provide himself with a smoker, veil, foundation fastener and some good book of instruction, and if he wants to keep up with the times he should take one of the bee journals at least. Also if one keep ten or more colonies, he should have a wax extractor. All these can be had from six to eight dollars.

## BEE-KEEPING IN CONNECTION WITH OTHER BUSINESS.

It is generally best for one with limited means who wishes to commence bee-keeping, to begin in a small way—say, from one to ten colonies of pure stock and good, frame hives. Then experience increases as colonies increase and one is much more likely to succeed with the business. It is best also—at least it is in the beginning—to have some other line of business in connection with this, as there is such a wide variation in the profits in different seasons. While one's surplus honey may run up into the hundreds of pounds, per colony, in one season, the next year may prove an entire failure. So if one has not means ahead to tide him over such seasons, it is best to have some other source of revenue. General farming does not suit very well in this connection on account of the swarming and honey-making season coming right in harvest time; but if one does not raise much small grain, this may work well. Poultry-keeping fits in nicely and the two go well together, but perhaps no other business suits so naturally as fruit culture because each are somewhat dependent upon the other. The fruit bloom comes in the early spring when the bees are likely to be in the greatest need of stores, and they specially need the stimulus of the honey coming in at this season, for brood-rearing, in order that there may be plenty of "harvest hands" to gather the sweets from the white clover bloom, which is the main honey harvest of our State. Although so early, fruit bloom coming when it does, is an important factor to the bee-keeper, and *vice-versa,* and this brings us to the

### NECESSITY OF THE BEE IN HORTICULTURE.

It is a well established fact that many of our different kinds of fruit trees, vines and plants, are either entirely or partially dependent upon artificial fertilization and cross-fertilization, in order that fruit and seed may develop and mature. The wisdom of the Great Mind that planned all the wonders of nature is shown in the provision of the bee to fertilize the flower, and the honey and the pollen in the flower to attract and feed the bee, and in it all to provide fruit and honey for the happiness of mankind (and womankind). This subject may seem strange to some, and some may doubt or dispute that the bee is a necessity in order to the development and perfection of many kinds of fruit, but nature has so arranged it that the distribution of pollen is necessary for the production of fruit.

Some varieties are so constituted, that unless the pollen of a kindred variety is carried to it, they will be entirely fruitless. Some varieties of Strawberries and Pears are particularly suited to this class. To illustrate complete fertilization somewhat minutely, we will take the apple blossom: When we cut a mature apple open cross-wise, it shows five separate seed chambers grouped around the center in a star shape. The pistil is in five sections with conductors leading to the embryo seed chambers: and unless a grain of pollen reaches each one, the fertilization is incomplete. A perfect fertilization requires that the five different sections leading from the stigma, come in contact with the pollen. An apple blossom has many stamens and the pollen is produced at the extreme end of each one, forming an enlargement called the anther. A single anther contains a vast number of grains of pollen of which only five are needed to fertilize one blossom. The raspberry fruit is composed of many separate little sections, each containg a seed, and so the blossom is constructed in a like manner. What will later be the fruit is present in an embryo state, many little sections in miniature, and from each of them protrudes the stiles like a fine, short hair. A grain of pollen must be conducted through every one of these little hair-like tubes, the end of which is the receptive organ called the stigma. A bee after alighting on a blossom in search of honey, which is to be found at the base of the blossom, rubs over the anthers with its body, which is covered, especially on the underside with many hairs of a compound, feather-like nature, and becomes covered with the pollen dust; turning around first one way and then another, in order to reach all the nectar secreting glands, it brushes again and again over the many protruding stamens.

One bee after another visits the same blossom at intervals, as long as the secretion lasts; and in time every one of the stigmas receives its grain of pollen, and a perfect fruit results.

During the early part of the season when the pear and apple trees bloom, the weather is often unfavorable for pollenation—the pollen being to moist and sticky. Under such circumstances very little fruit can set. When the sun shines, for a time the pollen becomes too dry; so the more bees there are, the more fruit will set. There may be seasons when some varieties of fruit would set without the aid of the bees, but with other seasons, and other varieties, the bees are an absolute necessity. It would make this article too long to go over minutely the different kinds of fruit which are partially or wholly dependent upon the bee for fertilization; such as the cherry, the plumb, the pear, the apple, the raspberry, the gooseberry and even the huckelberry. We have good authority for claming that sometimes it happens that the apple or pear are partly fertilized and partly not; the result being lop-sided and imperfect fruit, the seed as well as the fruit failing to develope. As the honey-bee is the principal agent in the distribution of pollen, amongst fruit blossoms, one sees how important it is that the bees and the orchards are in close proximity; as cold or rain—one or both—are so liable to retard the work of the bee at this time of year how much the fruit grower should be interested in having plenty of bees to do the work fast, while the blooms are in a proper state for this important work.

## SPRAYING DURING FRUIT BLOOM.

The subject of spraying has become so important in view of increasing insect enemies, and as at least one manufacturer, we understand, has recommended spraying while the fruit trees are in bloom, we wish to call the attention of all fruit-growers to the great loss such a course would be likely to bring upon themselves by poisoning the bloom and killing their friend, the bee. It not only kills bees that visit the flowers, but when carried to the hive destroys the brood and even the Queen. Such treatment would not stand the test of the Golden Rule, and would it be good business management? The very best authorities assert its uselessness as well as its dangers, and I quote some of them as follows: "In all cases spraying should be delayed until after the bloom has fallen from the trees, or else performed before the trees blossom, and never be appled while the bloom is on the trees." (Prof. A. J. Cook, of California, in American Bee Journal, September 7th, 1899, page 565.)

### "A DANGEROUS PRACTICE."

"Spraying fruit trees while in bloom, with arsenical mixtures is dangerous, and in fair weather is liable to not only kill the bees that frequent the bloom, but also to destroy the young brood that is being fed at that time. *Spraying should not be done until all the bloom has fallen*". Prof. F. M. Webster, Bulletin 68, Ohio Agr. Exp. Station.

"Fruit trees should never be sprayed when in bloom, on account of the liability of poisoning honey-bees or other insects useful as cross-fertillizers." Farmers' Bulletin No. 29, U. S. Dept. Agr., by C. L. Marlott, M. S.

### "INJURY TO BLOSSOMS."

"The trees should not be sprayed while in blossom, for the spray may injure the delicate parts of the flour and the poison may kill the bees and other insects that play an important part in fertilizing the blossoms." Bulletin No. 86, New Series, N. Y. Agr. Exp. Station by S. A. Beach and W. Paddock.

"Never spray a fruit tree while it is in bloom. You may injure the delicate stigma and prevent pollination; and there is also danger of killing the bees." Bulletin No. 36, Agr. Exp. Sta. by I. M. Stedman.

### IT SHOULD BE A MISDMEANOR.

"Spraying fruit trees fn early spring to prevent the ravages of various insects is becoming very common. Spraying trees while in bloom is very likely to poison the nectar and destroy the honey-bee. This has been done in several cases. Not only have the mature bees been poisoned, but the brood has also been destroyed. The fact is very apparent that fruit-growers are nearly or quite as much interested in the presence of bees as are the bee keepers. Pomologists, then, may well join hands with the Apiarists in demanding and securing a law making it a grave misdemeanor to spray fruit trees while they are in bloom." Bulletin No. 26, Div. of Entomology, U. S. Dept. Agr.

# REPORT OF STATE ORNITHOLOGIST.

## BIRDS AND THEIR ECONOMIC VALUE.

Thus far, in this State, the subject of Ornithology has received very little attention, but it is still on a par with a majority of the other States of the Union. Its Agricultural Experiment Station having published one Bulletin, giving "A Preliminary List of the Birds of West Virginia," in 1888.

This work was done by Mr. Wm. D. Doan, an expert Ornithologist, who spent three months in the employ of the Station; and for the limited space of time in which he operated his list is wonderfully full and complete. He also made some investigations as to the migrations, feeding, etc., of some of the varieties, making a very interesting Bulletin.

The only other work done has been done by private individuals; and is, as far as I know, unpublished. This work consists of two lists; one by Mr. Wm. Brewster, "The Birds of Ritchie County," and the other by W. E. D. Scott, "The Birds of Kanawha County." I have never had the opportunity of seeing either of these lists, and if some one will send me the address of either of the gentlemen named, I shall be duly thankful.

The author of this article wrote a thesis for graduation at the West Virginia University, entitled the "Water Fowl of West Virginia." This is the most complete paper on this phase of the subject that has ever been written in the State, but this may perhaps be due to the fact that it is the only one.

This completes the list of Ornithological researches carried on in West Virginia, and while at the best, it is very meager; the work that has been done shows that some at least of the people of our Mountain State are keenly alive to the importance of pursuing this study in a systematic manner.

Of all the two hundred and odd varieties of birds in this State there is, probably, not one that does not destroy more noxious than beneficial insects or animals. This statement may be substantiated by glancing for a moment at any of the tables of contents of the stomachs of birds. Of these tables, those prepared by Dr. Warren and published by him in his "Birds of Pennsylvania," are of the most value to West Virginians from the fact that there is practically no difference between the food consumed by a bird in Pennsylvania and one in West Virginia. These tables, which want of space prevent me from giving, show us that the number of beneficial insects consumed by birds is, in most cases, very small, while the number of noxious insects consumed is very great. This then being proven and becoming an established fact, it is necessary for the farmer to set about to find some way to save his best friends and bug catchers from being ruthlessly destroyed. To do this there are two ways—the one arbitrary and the other positive; he may either post his farm and prohibit sportsmen from hunting on his place or he may enact laws in the Legislature of his State, and see that they are carried out, that will protect the birds and impose a heavy fine upon hunters and another class of people who shoot guns, but who are not sportsmen, should they hunt out of season or kill birds that are not game birds for the sake of killing or for millinery purposes.

The causes of destruction of birds may be divided into three heads: 1. for pleasure, 2. from the idea that the birds destroyed are injurious, 3. for the purpose of female adornment, viz, millinery.

1. For Pleasure. The destruction of game birds by sportsmen. This is a vital question and one that should not be lightly considered from the fact that our land game birds are among the most beneficial of any of the classes of birds. This is due to the fact that they are larger and therefore have greater capacity for eating insects. This first cause might be done away with if all sportsmen were gentlemen and would be content when they had killed a sufficient number; but this is not the case and so our game must be protected by law to keep it from being literally wiped off of the face of the earth.

2. From the idea that the Birds Destroyed are injurious. It is due to this wrong impression that many birds which are really beneficial have been hunted for years. Take the common crow for instance; the idea has become so deep seated that it has almost become in instinct. A young boy out with his first gun and not knowing anything of the bad reputation of the crow would kill it on sight while dozens of other varieties of birds would pass by him unharmed. Now this impression of the crows badness is wrong, radically wrong, for while he does suck eggs occasionally and pull up a grain of corn now and then his mischeivousness is more than compensated by the fact that he is a great destroyer of injurious insects as well. In this connection I must cite another instance. In one of the country papers in this State this summer I saw the following editorial: "It is not against the law to kill bull-bats; let us exterminate the pests." And this is from the pen of a man who is looked upon as being very bright. The fact is that the night hawk, or "bull-bat," devotes its time absolutely to catching insects particularly those that fly in the evening. In proof of this statement I copy the following table from Warren's "Birds of Penn."

| No. | Date. | Locality. | Food-materials. |
|---|---|---|---|
| 1. | May, 1879 | Chester Co. Pa. | Flies and other insects. |
| 2. | July, 1879 | Del. Co. Pa. | Grasshoppers. |
| 3. | May, 1880 | Chester Co. Pa. | Beetles and larvae. |
| 4. | Aug., 1880 | " " " | Many crickets, etc. |
| 5. | " " | " " " | " " " |
| 6. | " " | " " " | " " " |
| 7. | May, 1383 | " " " | Water beetles. |
| 8. | " " | " " " | Beetles and two lime-like masses. |
| 9. | April, 1885 | Orange Co. Fla. | Various insects. |
| 10. | " " | " " " | Beetles and large flies. |
| 11. | June, 1886 | Chester Co Pa. | Various insects. |

This shows as conclusively as it is possible to show anything that this bird is innocent of all harm. While it may occasionally eat an insect that is beneficial, its loss is more than compensated by the dozens of injurious insects that are caught to every one that is beneficial.

3. Destruction of Birds for Millinery Purposes. This last cause is by no means the least. Of a truth, it is far greater than either of the others; and while, so far, this State has been practically exempt from it, it is well to look a little into the depredations committed elsewhere and make provisions for the future. There is nothing more disgusting than to see a beautiful woman, who would rather die than wring the neck of a chicken, going to church and congratulating herself upon her piety and tender-heartedness, and all the while wearing the last remains of three or four of our most beautiful and beneficial birds, and sweetest songsters on her bonnet. I should advise any young man to consider the matter seriously before he asked a woman of this kind to become his wife, for she is either possessed of an unfeeling heart, or of a carelessness that is well-nigh criminal.

In order to illustrate the manner in which these feathers, wings, etc., are obtained, I will state that the "Anti-Vivisection Monthly" last spring gave an account of gulls being caught while asleep along the shores of the Atlantic and having their wings cut off and tail feathers pulled out; the poor birds being left to starve to death in this horribly mutilated condition. The following dispatch taken from "Our Dumb Animals" will throw some light upon the number of birds that must be killed to supply this demand:

"*Milford, Del.*—Contracts were closed here to-day for the bodies of 8,000 birds, to be killed for New York milliners, at from 10 to 50 cents apiece. The contract calls for meadow larks, bluebirds, red-wing blackbirds, crow blackbirds, English sparrows and baby owls."

This state of things brought to her attention it does not seem to the writer of this report that any woman with a particle of self-respect would wear feathers on her hat; but then God is a long way off from some people, while fashion takes His place in the infinitesimal quantity of gray matter they choose to call a brain.

We can find no more fitting close for this article than this extract taken from the "Anti-Vivisection" Monthly" regarding the slaughter of gulls for millinery purposes:

"The gull is a beautiful and useful bird. Its motions are a delight to the eye, and its habit of devouring refuse along the shore is a protection to the health of the community. And yet it is slaughtered by thousands, to gratify the wicked vanity of women. Never before do we remember having seen so many wings and breasts of gulls worn upon hats as we see this season. The Audubon Society of Rhode Island issues a leaflet on this subject, containing a poem by Wm. C. Gannett, from which we quote a verse:

"Oh, but the shame of it,
Oh, but the blame of it,
Price of a hat!
Just for a jauntiness brightening the street!
This is your halo, O, faces so sweet,—
*Death;* and for that!" "

REVIEW OF THE

# BULLETINS AND WORK

—OF THE—

# WEST VIRGINIA UNIVERSITY

## Agricultural Experiment Station.

FOR TWO YEARS, ENDING OCT. 1, 1900.

THE AGRICULTURAL EXPERIMENT STATION BUILDING.

# AGRICULTURAL EXPERIMENT STATION.

## Station Staff.

| | |
|---|---|
| James H. Stewart, A. M | Director and Agriculturist |
| A. D. Hopkins, Ph. D | Vice Director and Entomologist |
| Bert H. Hite, M. S | Chemist |
| L. C. Corbett, M. S | Horticulturist |
| W. E. Rumsey, B. S. Agr | Assistant Entomologist |
| Horace Atwood, M. S | Assistant Agriculturist |
| C. D. Howard, B. S | Assistant Chemist |

# A BRIEF REVIEW OF THE BULLETINS AND WORK OF THE STATION FOR TWO YEARS ENDING OCTOBER 1, 1900.

Since the publication of the Biennial Report of this Department for the years 1897-'98, the Agricultural Experiment Station, at Morgantown, (a brief report of which was then published) has made admirable progress. Its work has been materially systematized and substantially broadened along lines of both scientific and practical interest and value to the farmers of West Virginia. The equipment of the station has been very much improved. The old farm owned by the station has been

SHOWING THE REAR OF THE EXPERIMENT STATION BUILDING AND THE GREENHOUSES.

disposed of, and one well suited to its investigations has been secured, and it is being thoroughly equipped for experimental purposes. The work being conducted on this farm is good, and the problems under investigation there are of vast importance to agriculture in this State, and the results may be looked forward to with great interest. More lines of work are under way at the station than ever before, and more work is being done upon them than at any time in the history of the Experiment Station.

More than a terse review of the publications and work of the station during the time mentioned, our space will not allow.

EXPERIMENT FARM RESIDENCE.

All of the publications mentioned herein have been issued and distributed to the citizens of West Virginia who desired them, and more are available for distribution. Every up-to-date farmer should see to it that his name is upon the mailing list of the station, in order that he may be the recipient of such publications, from the reading of which he will derive great benefit.

Since our last report, three annual reports have been issued by the station. These reports, though in a large measure purely administrative, have very much of interest and value upon the scope and progress of the experiments under way at the station.

Mention is made herein of other and different lines of work not spoken of in bulletins, which are usually of experiments completed, it being the rule of the station not to issue bulletins upon investigations which have not been thoroughly worked out. For example, bulletin No. 56 is a report of nine years of arduous investigations, and while it was delayed for so many years, in justice to the subject it ought not to have been published earlier.

There are a number of other investigations of vast importance, upon which the station has not yet issued bulletins, but which will be reported in that way and distributed to all may desire them, whenever final conclusions are reached. As a rule the most important investigations involve an expenditure of corresponding time. What farmers want is just and proper conclusions, and that is what this station is doing for them.

*Bulletin No. 51*, upon the subject of commercial fertilizers, in addition to being an official report of work done by the station in compliance with the statute of the State imposing a supervisory control over fertilizers upon the officials of the station, has much valuable matter in relation to the origin and uses of fertilizers, the sort of information every farmer should possess, whatever may be his practice in the use of fertilizers. The author has, in part, this to say:

## COMPOSTION AND VALUATION OF COMMERCIAL FERTILIZERS.

Fertilizers may be divided, roughly, into two classes: direct or nutritive fertilizers and indirect or stimulant fertilizers. Fertilizers of the first class contain essential elements of plant food, and contribute directly to the building up of plant tissue. Quite a number of materials are used in the elaboration of plant tissues, and conspicuous among these are carbonic acid gas and water, from which often 90 per cent. of the entire plant is derived, but as these are always present, generally in the greatest abundance, we do not always have them in mind when speaking of plant food, but restrict this term to include about a dozen materials which plants obtain from the soil. Most of these, in turn, are present, even in the poorest soils, and in sufficient quantities for the heaviest crops, so that it is seldom necessary to add them to the soil. Three of these materials, however, nitrogen, potash and phosphoric acid, are likely to become exhausted from the soils, by continuous heavy crops, so that it is some one or two, or all three of these ingredients that poor soils generally lack. If we include the nitrogen of the air, which is always present, it must indeed be said that even these ingredients are always present in the greatest abundance for the very heaviest crops. It is the phosphoric acid, potash, and nitrogen, *in available form*, that is likely to become exhausted, and which must then be added to the soil, and so it is the "*available* phosphoric acid," "*available* potash," and "*available* nitrogen" that constitute the valuable ingredients of a fertilizer.

In order to meet the needs of crops and the deficiencies of soils on which crops are grown, fertilizers are prepared containing any one or two or all of these ingredients, so there are fertilizers containing:

Phosphoric acid alone (as in "Acid Phosphates"); Potash alone (as in "Kainit" and other potash compounds); Nitrogen alone (Ammonia compounds), Phosphoric acid and Potash (acid phosphates and potash, "Bone and Potash"); Phosphoric acid and Nitrogen ("Ground Bones," "Dissolved Animal Bones"); Potash and Nitrogen (saltpetre); Phosphoric acid, Potash and Nitrogen ("guanos" and other "complete fertilizers").

## THE PHOSPHORIC ACIDS.

Notwithstanding the fact that we have occasion so often to use the term "phosphoric acid" in describing fertilizers, there is really no free phosphoric acid in them. Free phosphoric acid is always readily "soluble" in water and never "reverts." Free phosphoric acid readily combines with lime to form a "phosphate of lime," or "calcium phosphate. "It combines with lime in three proportions to form three different "phosphates of lime," or "calcium phosphates," as they are often called. The prefixes "mono" (one), "di" (two), and "tri" (three) are conveniently used in describing these compounds of phosphoric acid with lime.

Phosphoric acid combines with one part of lime to form "mono calcium phosphate," a compound that is soluble in water. The phosphoric acid ($P_2 O_5$) *combined in this way* (with one part of lime) is known as "soluble phosphoric acid."

The phosphate of lime containing *two* parts of lime and known as di calcium phosphate is not soluble in water. It is soluble in a solution of ammonium citrate, and for that reason the name "citrate soluble" is used. It is generally known as the "reverted" phosphate, and the phosphoric acid ($P_2 O_5$) which it contains is generally known as "reverted phosphoric acid."

The phosphate of lime containing three parts of lime and known as a tri calcium phosphate is insoluble in water and ammonium citrate, and the phosporic acid ($P_2 O_5$) combined in this way is called "insoluble phosphoric acid." Insoluble phosphate of lime is found in abundance in the phosphatic rocks of South Carolina, Florida, and Tennessee. It is also found in bones, bone black, bone ash, etc. It is from this insoluble phosphate that the soluble and reverted phosphates are made.

It is to be observed that the solubility of the three phosphates of lime, mentioned above, decreases as the quantity of lime (Ca O) in combination increases, the mono calcium phosphate being readily soluble in water, the di calcium phosphate being insoluble in water, but soluble in ammonium citrate, while tri calcium phosphate is insoluble in either water or ammonium citrate.

The soluble and reverted phosphates taken together constitute the available phosphates. In order to convert the insoluble phosphate into one of the available forms, it is only necessary to remove one or two of the three parts of the lime in combination. This is done by treating the insoluble phosphate, in the form of phosphate rock, ground bone, bone ash, etc., with sulphuric acid (oil of vitriol) which takes possession of one or two parts of the lime (depending upon the quantity of vitriol used) to form sulphate of lime (gypsum, land plaster), leaving di calcium or mono calcium phosphate, either of which is available. A portion of the mono calcium or soluble phosphate prepared in this way may take up another part of lime to form the di calcium phosphate and so "pass back" ("revert") to a less soluble form. This accounts for the names "reverted phosphate of lime" and "reverted phosphoric acid."

We trust this brief and imperfect explanation will serve to give a general idea of these transformations. One or two points should be noted:

1. The starting point in the manufacture of available phosphates is the insoluble phosphate. In order to render this avalable, a part of the lime in combination must be removed, and this cannot be done except by chemical agencies.

2. The sulphuric acid (vitriol) used for this purpose, is an "acid"—a "chemical." It is, indeed, one of the most "violent chemicals," but the gypsum, land plaster, formed when the acid combines with the lime, is a perfectly neutral substance, which is often used as a fertilizer. Fertilizer manufacturers make no special claim for the gypsum, and seem to attach no special value to it. Many of them would, doubtless, remove the gypsum in order to cut down the bulk of the fertilizer, if there was any practical method of doing this. We mention this matter in order to allay the anxiety that has been aroused in some sections by the oracles (on *all* agricultural subjects) who in catering to a prejudice (for which they are largely responsible) find this subject of "chemicals" and "chemical manures" a very valuable bit of stock in trade, but who generally forget to state that the "strong acid" which is to play such havoc in the soil on which it is used, has been converted into gypsum, land plaster, the very material which they often recommend to correct these disastrous effects.

Available phosphates may be prepared by treating the rock phosphate with phosphoric acid (instead of sulphuric acid) in which case, of course, no gypsum will be formed, but in its stead there will be formed a corresponding amount of available phosphates. Evidently very highly concentrated fertilizers may be prepared in this way. They are the true "superphosphates," but this term is often used in describing ordinary phosphates. The advantages for these goods are a more concentrated product and a consequent saving in freight. The available phosphates contained in them are the same as in the ordinary phosphate.

## THOMAS SLAG.

We have spoken of three phosphates of lime—the mono, di and tri calcium phosphates. There is another phosphate coming into the market and known as Thomas Slag, or "odorless phosphate." In this material we have to deal with a *tetra* calcium phosphate or "tetra basic phosphate," as it is sometimes called. It is formed as a by-product in the manufacture of iron and steel, from certain kinds of ore containing phosphorus compounds. When ground to a fine powder it is insoluble in water, but soluble to some extent in ammonium citrate solutions. We have had very little to do with it at this station. Reports from those who have used it show that the practical results "have been varied, often being most excellent and again very indifferent."

We are often asked: "What other materials does a phosphate contain besides the phosphoric acid recorded in the table?" Or, as the question is generally put: "I see this phosphate contains 16 per cent. of phosphoric acid; now what is the other 84 per cent?" The phosphate rock does not consist entirely of calcium phosphate. There are other materials, such as sand, clay, lime, moisture, and organic matter. These often amount to 30 per cent. This would leave 70 per cent. for calcium phosphate, and only about 45.8 per cent. of this amount is phosphoric acid ($P^2 O^5$); the rest is lime (Ca O). So this rock would contain but 45.8 per cent. of 70 per cent., or about 32 per cent. of phosphoric acid. In order to get this into available form, the ground rock must be treated with about an equal weight of sulphuric acid, and this, of course, divides the per cent. of phosphoric acid by 2. We are not manufacturers, and do not offer the above as absolutely accurate, but simply to show (what is undoubtedly true) that "the other 84 per cent" may be easily accounted for.

## POTASH.

The common sources of potash in commercial fertilizers are the following:

Camallite which contains 13 per cent. to 14 per cent. actual potash ($K_2O$); Kainit (12 to 14 per cent.); Krugite (8 to 9 per cent.); Sulphate of Potash (48 to 51 per cent.) Sulphate of Potash and Magnesia (26 to 28 per cent.); Nitrate of Potash (44 to 46 per cent.) Wood ashes (3 to 7 per cent.); Tobacco stems (6 to 7 per cent.)

Most of these materials are obtained from the great potash mines of Germany. All such potash salts are soluble in water, so they do not need to be treated in any way to render them available. Potash compounds that are not soluble in water are disregarded in estimating the value of a fertilizer.

## NITROGEN.

Nitrogen is more expensive than phosphoric acid and potash combined. This is not so much because nitrogen is so scarce (although it is one of the rarer elements) for it constitutes nearly four-fifths of the air. Plants live in it, but as a rule they cannot obtain from this source even the relatively small amount they require. This appears the more strange in view of the fact that plants requiring a hundred times as much carbon (as nitrogen) have no trouble whatever in obtaining this from the four parts of carbonic acid gas in ten thousand parts of air. But it is a condition which confronts us; plants as a rule cannot obtain their nitrogen from the air, and it is not until the nitrogen has been oxidized by combustion, electrical discharges, or the action of certain micro-organisms that it assumes an agricultural value.

Nitrogen combines with oxygen to form an oxide of nitrogen which combines with water to form nitric acid (aqua fortis) and this, in turn, combines with soda to farm nitrate of soda (Chile saltpetre), one of the most important sources of nitrogen in fertilizers.

Fourteen parts (by weight) of nitrogen combine with three parts of hydrogen to form ammonia (hartshorn), so 1.00 per cent. of ammonia is equal to 0.82 per cent. of nitrogen. Ammonia combines with sulphuric acid (oil of vitriol, the overworked goblin of the anti-"chemical" brethren) to form sulphate of ammoniam, a most excellent source of nitrogen for manurial purposes.

Other sources of nitrogen in commercial fertilizers are cotton seed meal, castor bean pomace, tobacco postems, fish scrap, dried blood, ground bone, wool waste, horns, hoofs, and animal refuse generally.

It is believed that all nitrogenous materials applied to the soil must be broken down and the nitrogen fully oxidized to "nitric" nitrogen (the form in which it exists in nitric acid and its compounds), before it can be used by plants. This transformation is known as "nitrification" and is effected by means of certain micro-organisms. There are some plants, notably those of the leguminous family (clovers, etc.,) which permit the development, on their rootlets, of colonies of bacteria, which have the power to render atmospheric nitrogen available for plant growth. In such cases there is no reason for believing that the host plant has any further part in these transformations than to afford a suitable place for the growth of the bacteria.

It is to be observed that none of these nitrifying organisms can live on nitrogen alone. They are plants of a low order and require other constituents of plant food, notably phosphoric acid. It is interesting to note the time required to dislodge a prejudice as unreasonable as that which condemns the so-called "chemical" manures, and the readiness with which any theory which promises something for nothing will be accepted. No sooner did something in regard to the action of these nitrifying organisms begin to be generally known than there were those who seemed to think that a field could be farmed until nothing but taxes would grow on it, and then put in good shape by simply sowing a little clover seed on it, and leaving the bacteria to do the rest.

The value of these nitrifying organisms to agriculture, no one can estimate. The possibilities to be revealed as investigations along these lines proceed, may be greater than even the most sanguine, at present, would venture to predict, but there is little to indicate that anything but disappointments need be expected from any "nitrogen for nothing" hypotheses. The bacteria that will furnish available nitrogen gratis and board themselves have yet to be discovered.

## FARM MANURE.

Another source of phosphoric acid, potash and nitrogen, (not in commercial fertilizers to be sure) is farm manure, barnyard manure, and as it is with this material that "chemical manures" are generally compared, a few words in regard to it may not be out of place in this connection. No one else at the Station is to be held in any way responsible for the little we shall say, and it should be remembered that we are not the agriculcurist, and so do not speak as one having authority in such matters.

Farm manure has a value. It is one of the most important by products of the farm. To waste it should be a sort of extravagance that no system of farm economy could stand. It is well worthy of a great deal more care and attention than it generally receives. It is just so much money saved, and may often be made a very respectable item in the profits of the farm. Every one knows that farm manure is all this and perhaps a great deal more, and fortunate for us all, this is true, but let us mention briefly what farm manure is *not*.

It is not a well balanced fertilizer. It contains a small amount of all the essential elements of plant food, but not in the proportions ordinarily required, so it cannot always be used economically, at least by itself.

The essential elements which it does contain are not as valuable, pound for pound, as those in a well made commercial fertilizer, because they are not in as readily available form. We are fully aware that this statement is never allowed to go unchallenged by some who insist upon the possibilities of all sorts of reactions for such a complex mixture, and so attribute to the farm manure, a value that is simply out of all proportion to the plant food it actually contains. In the absence of any evidence supporting such claims, however, it might be just as well to remember that the chemical analysis says they are not as readily available, and there is nothing in the treatment to which the constituents of the manure have been subjected, that would indicate that the analysis is not in accordance with the facts. There is always more or less mystery connected with the operations that take place in an animal body, but this is not the case with a finished product. Subsequent fermentation and decomposition, in a *properly managed* manure pile, do greatly increase the availability, but these transformations are largely a matter of conditions, the ideals of which are seldom, if ever, realized.

The above is about as much as can be said on the subject of farm manure without referring to

## HUMUS.

Humus is one (or rather a number) of the many products of the decomposition of organic matter in the soil. It has a mechanical action on the soil, similar to that of lime, in that it will break up as a soil that is too compact and tighten one that is too loose. It also has the power of preventing the loss of some of the readily soluble forms of plant food, by combining with them to form compounds that are insoluble; and has associated with it the more important elements of plant food. Indeed such a variety of valuable points can hardly be claimed for any other fertilizer, and it seems almost unkind to add that agricultural plants (excepting mushrooms) can grow perfectly well without any humus. But humus is undoubtedly a valuable addition to the soil.

Farm manure contains more or less humus, and for this it should, and generally does, receive full credit. But farm manure is not the only source of humus. The roots, leaves, stubble, etc., of each crop contribute to the supply, which may be increased to almost any desired amount, and at the same time, a liberal supply of nitrogen may be provided by turning under a *well-fed* crop of clover or other leguminous plants.

We do not wish to discourage farmers in using the manure which their farms produce. As we have said, we believe it is well worthy a great deal more attention than it ordinarily receives, and even if we are right in the above (which it is needless to say is in no sense original with us) and if farmers have been paying fancy prices for farm manure, this in no way decreases its undoubted value.

If we are wrong, the voluminous articles on this subject that have appeared in agricultural papers, since "the time whereof the memory of man runneth not to the contrary," may certainly be relied upon to furnish a sufficient antidote."

## STIMULANT FERTILIZERS.

The principal indirect or stimulant fertilizers, are land plaster and lime. These materials do not contain, and so do not furnish directly, to the soil, any constituents of plant food that are not likely to be present in abundance. Their chief value depends upon their power to change unavailable forms of plant food already in the soil, into available forms.

Land plaster (known also as gypsum, calcium sulphate, sulphate of lime) has long been used as a fertilizer and probably acts in a number of ways, the most important of which is that of consulting insoluble compounds of potash into available form. Moist gypsum may be used to prevent loss of ammonia from decomposing nitrogenous matter in stable manure, etc. It also favors, in some way, the nitrification processes already referred to.

Gypsum, it will be remembered, is a compound of lime and sulphuric acid, and its value depends as much upon the acid portion of the compound as upon the lime. It is the sulphate of potash that goes into solution when gypsum acts upon the soil, and it is the sulphate of ammonia that is formed when gypsum prevents the loss of this material.

Lime (quick lime, calcium oxide) as every one knows is made by burning limestone (carbonate of lime). In this operation the carbonic acid gas is driven off, leaving "burnt lime" or calcium oxide. When this is applied to the soil, it soon takes up carbonic acid gas and passes back to the carbonate of lime, but it is then in a much more finely divided condition than it existed in the limestone.

Lime improves the mechanical condition of soils, by loosening heavy clay soil and compacting loose sandy soil. By its chemical action, insoluble mineral substances containing potash are converted into available form; it also aids in the decomposition of animal and vegetable matter. It may be used to correct the abnormal acidity of "sour lands," notably sour meadow lands, and its effect is often readily perceptible in the disappearance of certain objectionable plants that had previously threatened to thrive to the extermination of everything else.

"Stimulant fertilizers," like all other stimulants, have their uses, but may be used to excess. It should be remembered that they add no constituent of plant food that the soil is likely to need. Their principal value lies in their power to draw on the plant food already in the soil. They should not be used frequently or in large quantities, and should always be accompanied by a liberal supply of actual plant food.

## HOME MIXING.

After looking over the array of plant food stuffs regularly on sale in the state, as shown in the tables, one would hardly suppose that it would be necessary to prepare many special mixtures at the farm, and yet we are continually being asked for our opinion on this subject. The proposition to "buy the materials and compound the fertilizer with special reference to the needs of the soil and crops," is simply ideal, and we would like to be among the last to discourage any method toward which scientific agriculture may be tending, but the question, as it appears to us, is whether this can be accomplished any better or cheaper at the farm, working in a small way with little or no equipment, than at a factory with every facility for carrying out every part of the wark.

The preparation of *small quantities* of special mixtures for *experimental* purposes, only, is of course another matter altogether, and cannot be too highly recommended. It would certainly be a most fascinating and instructive line of work, and if carefully carried out, would lead to results of greatest value in selecting fertilizers. If anyone working in this way should discover a new and valuable prescription for a fertilizer, we are confident that he would have no trouble in finding dozens of manufacturers who would be only too glad to put up the goods for him in any quantity, much more satisfactorily and probably for less money than he could make it himself.

This bulletin also contains a very valuable discussion of "guaranteed analyses", and of inspection made of fertilizers *on* sale by the authorized agents of the Director of the Station, at different points in the state. In addition to the other subjects discussed in this bulletin, there are some valuable suggestions relative to the violations of the fertilizer law, of which the writer has the following to say:

## VIOLATIONS OF THE FERTILIZER LAW.

Year after year the manufacturing establishments whose names are so familiar to the farmers of this state have been complying with our fertilizer law. Most of them, we believe, have been making a reasonable effort to carry out not only the letter but also the spirit of the law, and to their credit it could be said, have seemed to court rather than to try to avoid the rigid examination of their goods which the law requires. It occasionally happens, however, that a manufacturer (for reasons that the people, through their representatives doubtless had in mind when the law was framed) decides that he does not care to have his goods subjected to such an examination, and so tries to devise some scheme to dodge the law. One would think that any effort to dodge such an examination would be sufficient of itself to arouse suspicion, and it seems that this is true in this state.

The American Fertilizer Co., of Washington, D. C., has been endeavoring to induce the farmers of this state to buy their "Natural Plant Food" without having it examined at the Station. They have spent many times the ten dollars that would have been required to register the goods in trying to convince the farmers that such registration is unnecessary. Posters and truly excellent letters for the purpose have been scattered all over the state, but be it said to the credit of the farmers of this state, that we have not been able to find a single sack of the goods, though we have hunted all over the state for it. West Virginia seems to be lacking in the class of farmers who can be duped in this way, and in this connection it is interesting to note that this company tries to make great capital of the statement (certainly not of the fact) that their goods contain "no chemicals." Indeed they have worked this old prejudice for all it is worth, but it seems that the farmers of this state know (whether these manufacturers do or not) that plant food consists entirely of "chemicals," and that a supposed plant food, whether "natural" or of any other sort that contains "no chemicals" must be pretty light diet.

This company claims to enjoy immunity from the operations of the statutes of West Virginia concerning commercial fertilizers by virtue of certain interstate commerce regulations. This position is simply untenable, and those who may be induced to act as dealers or agents, for this or any other unregistered brand of fertilizer, will lay themselves liable for prosecutions according to the provisions of the aforesaid Act.

The Station has done a vast deal of good for the farmers of this state in the way of driving out fraudulent enterprises which have undertaken to put upon the markets spurious and useless socalled fertilizers, evidently with the intent to deceive and cheat the farmers who buy them. The vigorous exposures made by the Director of the Station of such fraudulent concerns, we are glad to report, has driven them out of the markets of West Virginia.

*Bulletin No. 52.* "Strawberries." This bulletin is concerned with a statement of the results of two season's work with strawberries on the Station grounds. During the first year the plants were grown in the hills, and during the second the results are based on the behavior of the same varieties when grown in matted rows. In addition to the comparison of the sorts on the basis of the two systems of culture, general directions for the planting, care and management of a strawberry bed are given. Notes on varieties were also incorporated for the purpose of aiding the grower in an intelligent selection of sorts as well as for the purpose of throwing light upon the variation of the same varieties under various conditions of culture, soil and exposure. The brief paragraphs which summarize the contents of the bulletin are here reproduced.

## PARAGRAPHS.

No land owner should be without a strawberry patch.

No fruit will return a greater income for time and money expended than the strawberry.

Pistillate plants usually bear the largest fruits, but perfect flowering sorts must be planted close by to insure perfect pollination and a crop of fruit.

It is the remarkably *early* and remarkably *late* crops that return the profit in strawberry culture.

Care in grading the fruit pays better with the strawberry than with any other crop. Make three grades in price and in quality of fruit. The results will be gratifying.

Use only neat, clean packages of full size.

Crop failures are less frequent with strawberries than with any other small fruit.

Good plants, carefully set, well tended, and the fruits marketed in attactive packages are sure to return the grower satisfaction.

For general plantations, select only well tried sorts. Varieties are local. Hence, failure is more likely to result from dabbling largely in novelties than from any other single cause.

Test the novelties in a small way. Do not venture a year's return upon an untried sort.

The best berry is that which possesses attractive appearance with shipping qualities, good size, productiveness, and general vigor of plant.

The following names from the list of varieties on page 100, stood the highest in a two years test at the Station:—

Wolverton, Eureka, Ponderosa, Cumberland, Brandywine, Greenville, Enormous, Arrow, Belle, Crescent, Enhance, Parker Earle, Trimbell, Warfield No. 2, Mary, American Queen, Allen.

The following names are those of the ten sorts bearing largest fruits in 1896:

Bubach No. 5, Belle, Mary, Allen, Eureka, Trimbell, Brandywine, Ponderosa, Sharpless, Rio; in 1897, the list was as follows: Allen Trimbell, Salser's Earliest, Wolverton, Eureka, Belle, American Queen, Ponderosa, Brandywine, Enhance.

In productiveness the sorts range as follows:

In 1896, Crescent, Warfield No. 2, Sharpless, Cyclone. Wolverton, Princeton Chief, Anon, Wilson, Enhance, Enormous. In 1897, the varieties ranked as follows: Crescent, Ponderosa, Arrow. Haviland, Cyclone, Eureka, Princeton Chief, Rio, Greenville, Anon.

Southern exposures with quick soil and light mulch, if any, for early crop.

A north hillside and heavy mulch for the late crop.

Never use old sod land for a strawberry patch.

*In Bulletin No. 53*, "On Commercial Fertilizers" published the January following the publication of Bulletin No. 51, the author has the following to say:

### "VIOLATIONS OF THE FERTILIZER LAW."

Year after year the manufacturing establishments whose names are so familiar to the farmers of this State have been complying with our fertilizer law. Most of them, we believe, have been making a reasonable effort to carry out not only the letter, but also the spirit of the law, and to their credit it should be said, have seemed to court rather than to try to avoid the rigid examination of their goods which the law requires. It occasionally happens, however, that a manufacturer (for reasons that the people, through their representatives, doubtless had in mind when the law was framed,) decides that he does not care to have his fertilizers subjected to such an examination, and so tries to devise some scheme to dodge the law. One would think that any effort to dodge such examination would be sufficient of itself to arouse suspicion, and it seems that this is true in this State.

The American Fertilizer Co., of Washington, D. C., has been endeavoring to induce the farmers of this State to buy their "Natural Plant Food" without having it examined at the Station. They have spent many times the ten dollars that would have been required to register the goods in trying to convince farmers that such registration is unnecessary. Posters and truly excellent letters for the purpose have been scattered all over the State, but be it said to the credit of the farmers of this State that we have not been able to find a single sack of it, though we have hunted all over the State for it. West Virginia seems to be lacking in the class of farmers who can be duped in this way, and in this connection it is interesting to note that this company tries to make great capital of the statement (certainly not of the fact, that their goods contain "no chemicals."

Indeed they have worked this old prejudice for all it is worth, but it seems that the farmers of this State know (whether these manufacturers do or not,) that plant food consists entirely of "Chemicals," and that a supposed plant food, whether "natural" or of any other sort that contains "no chemicals" must be pretty light diet.

"This company claims to enjoy immunity from the operations of the statutes of West Virginia concerning commercial fertilizers by virtue of certain interstate commerce regulations. This position is simply untenable, and those who may be induced to act as dealers or agents, for this or any other unregistered brand of fertilizers, will lay themselves liable to prosecutions according to the provisions of the aforesaid Act."

Inasmuch as we had not been able at that time to find any of this material on sale in this State we hoped the above would be sufficient. It seems, however, that in spite of our word of warning, this company has succeeded in shipping several car loads of this stuff into the State during this year. Those who have already invested in it will need no further warning, but in order to save others the disappointment that will certainly follow if they put their money into this stuff we will add to what we have already said, that judging by the reports of those connected with fertilizer controls in other states, the letters we have received from those who have used it in this State, and the analysis of all the samples we have been able to find in this State, we regard this stuff at anything like the price usually asked for it as a plain swindle.

It is nothing more nor less than insoluble phosphate rock ground up and mixed with some New Jersey "green sand," no part of the mixture being treated in any way to render available anything that might be contained in it.

As has been explained in a number of fertilizer bulletins from this Station, the phosphoric acid in phosphate rock is all insoluble. In order to render it available manufacturers of standard goods grind up the rock and treat it with a strong acid, (Sulphuric Acid,) when it becomes the "Acid Phosphate," Dis. S. C. Phosphate, Dis. Bone Phosphate, etc., of commerce. No manufacturer worthy of the name would think of claiming any agricultural value for the untreated rock although they all have large quantities of it on hand; and the treatment with the acid is a very expensive process.

Again the rock used in the samples of "Natural Plant Food" analyzed at the Station was either mixed with a good deal of "green sand" (or some other material,) or it was a very poor stuff even as a raw material from which to make a decent acid phosphate, indeed if it had been treated in the usual way, (with sulphuric acid, in order to render available the little phosphoric acid it did contain,) it would not have been worth more than about $6 per ton.

As for the potash which the "Natural Plant Food Co." claims is derived from the mineral Glauconite or "green sand" of New Jersey, we would say that Glauconite does contain potash, and we might add, so does granite, and there is no reason for believing that the potash in the one is any more readily available than in the other.

*Bulletin No. 54*, "Nursery Hints." This bulletin is a concise statement of the general principles and practices of the art of prapagating plants. It is concerned with a general statement regarding the selection of a cite for the nursery and then takes up in a systematic way the various means of increasing plants from seeds, layers, cullings, buds, grafts, etc. Each method is described and as far as practicable illustrated by drawings. As an illustration of the character of subjects, together with treatment of same, the following extract on grafting is here reproduced:

### GRAFTING.

*Grafting.* "Grafting is the process or operation of inserting a cion into a stock."

*Cion or Scion*, "a portion of a plant inserted upon the same or another plant, with the intention that it shall grow."

The wood for coins like that for hard wood cuttings must be taken while in a dormant or resting condition. The time usually considered best is after the leaves have fallen, but before severe freezing begins in early winter. The cions are then tied in bunches and buried in moist sand where they will not freeze, and yet be kept cold enough to prevent germination, Good results often follow cutting cions in the spring just before or at the time the grafting is to be done. If cleft-grafting is the style to be employed, this practice frequently gives good results, but spring cutting of cions for whip grafting i. e. root grafting, is not desirable, as not enough time is given for proper healing of the wound before planting time in the spring.

Were all forms of the art of grafting to be taken from the horticulturist to-day, commercial fruit growing in its high state of perfection would decay with the orchards now standing.

All horticultural varieties or sorts of fruits belonging either to the pomes, drupes, or citrous classes, are now multiplied by budding or grafting. These arts are really the corner stones upon which the entire horticultural superstructure of to-day rests. The progress in plant-breeding and the great rapidity with which new sorts are now disseminated, could not be attained without the aid of budding or grafting. Under existing conditions, it is not necessary for the originator of a new

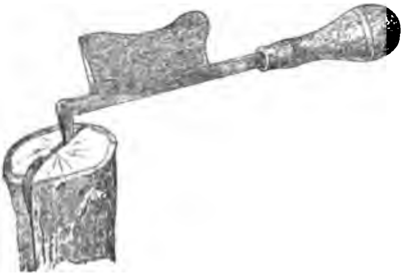

Fig. XVII.

sort of apples to give any thought to the question of fixing that type so it may be reproduced from seed; the method of reproducing the sort does not enter as a factor in his efforts to secure the desired variation. Grafting or budding has settled that long ago, but were it otherwise horticulturists would be studying different problems, and the nurseryman would be more of a scientist than a manufacturer.

*Cleft Graft.* This style of graft is particularly adapted to large trees when for any reason it becomes necessary to change the variety. Branches too large to be worked by any of the methods hereafter described can be grafted by this method.

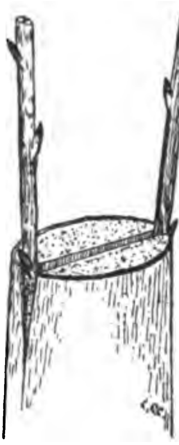
Fig. XIX.

A branch 1 or 1½ inches in diameter is severed with a saw. A second cut should generally be made a few inches below the first one in order that the bark shall not be loosened from any portion of the stub. Split the exposed end with a broad, thin chisel or emplement such as shown in Fig. XVII; then with a wedge or the wedge shaped prong at the end of the grafting tool, spread the split stock so the cions shown at Fig. XVIII may be inserted. The completed operation is shown at Fig. XIX.

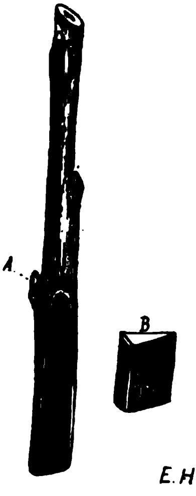

Fig. XVIII.

The cion should consist of a portion of the previous season's growth of the variety to be propagated, and long enough to have two or three buds. In general, it is a good plan to cut the cion so that the basal or proximal bed shall be located just at the base of the opening of the triangle formed in cutting the cion into the wedge shape necessary in this style of graft. The situation of the bud is shown at *a*, Fig. XVIII. In addition to the advantage of having the proximal bud located as above described, the wedge of the cion should be thicker on the side to face outward when the cion is in position as shown at *b* Fig. XVIII. The advantage of this will be noted from Fig. XX, which shows how the pressure of the stock is brought upon the outer growing parts of both cion and stock, whereas, were the cion thicker on the inner side the conditions would be reversed and the death of the cion would follow; there would be no flow of sap from stock to cion, as the contact would be between heart-wood and growing wood, instead of between two growing layers.

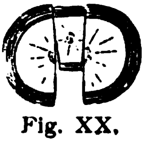
Fig. XX.

The importance of having an intimate connection between the growing tissues of both cion and stock cannot be too strongly emphasized, for upon this alone the success of grafting depends. To make this contact of the growing portions doubly certain, the cion is often set at a slight angle with the stock into which it is inserted, in order to cause the growing portions of the two to cross.

*Grafting Wax.* In this climate a soft wax is not desirable for exposed work. Soft wax may be used in whip-grafting, but in cleft grafting where all wounded surfaces are exposed to the weather, a hard wax, made by melting together five pounds resin, two and a half pounds bees-wax, and one half pound of tallow or one-half pint Linseed oil, is preferable.

*Waxing* is quite as important as a proper adjustment of the cions. This consists in covering all cut or exposed surfaces with grafting wax, grafting clay, or some non-corrosive substance which will exclude air and moisture. The wax may be applied hot, with a brush, but the safest plan is to spread it with the hand while it is only sufficiently heated to allow it to be worked like taffy. If spread carefully over all cut surfaces and pressed closely, upon cooling it will form a sleek coating quite impenetrable to air and moisture.

*Waxed String.* The wax for this purpose should be a softer wax than that to be used on parts above ground, hence the following is preferred; Resin 4 parts by weight; bees-wax, 2 parts; tallow 1 part. Heat until all parts go into solution, then pour into a pail of cold water. Work in the hands until all lumps have been softened and the mass is of uniform consistency. This will be found to be an excellent wax for cool climates, as well as a superior one for soaking knitting cotton to bind stock and cion together in whip, saddle or veneer grafting. Melt a portion of the wax above described in a convenient receptacle and dip a ball of No. 18 knitting cotton into the molten wax, leaving it long enough to become thoroughly soaked; remove to allow it to cool and the waxed twine is ready for use. If preferred, strips of muslin or other light cloth can be soaked in the molten wax and used as a substitute for the waxed cord. In general, however, it is believed that the waxed knitting cotton will be found most convenient.

*Whip Grafting.* This style of grafting is the one most universally used in root grafting. It has the advantage of being well adapted to small plants only one or two years of age, as well as the other great consideration that it can be done indoors during the comparative leisure of winter.

The graft is made by cutting the stock off diagonally—one long, smooth cut with a sharp knife, leaving about three-fourths of an inch of cut surface, as shown in Fig. XXI, which is ideal. Without changing the stock, place the knife about one-third of the distance from the end of the cut surface, at right angles to the cut, and split the part in the direction of its long axis. Cut the reverse end of the cion in like manner, as shown in Fig. XXII, and when the two parts are forced together, as shown in Fig. XXIII, the cut surfaces will fit neatly together and one will nearly cover the other, if cion and stock are of the same size. A difference in diameter of the two parts to be united may be disregarded, unless it be too great. After the cion and stock have been locked together as shown in Fig. XXIII, they should be wrapped with five or six turns of waxed cotton, in order that the parts may be held firmly together.

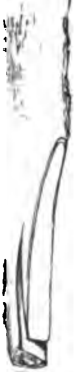
Fig. XXI

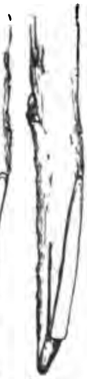
Fig. XXII.

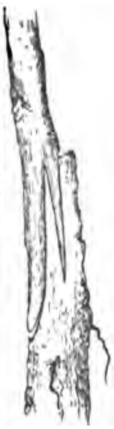
Fig. XXIII

The root or stock may be left any convenient length from 2½ to 6 inches, and the cion cut accordingly. In general, the shorter the root the longer the cion, and vice versa. The practices of the more rigorous climates tend to short piece roots and long cions. At planting time the whip graft, when used upon small stocks, should have the cion covered as well as the stock, the topmost bud of the cion, if any, left above the soil. If the graft is to be exposed, it should be covered with waxed muslin, or with the harder wax above described. When deeply planted, either in a furrow or with a dibble, the waxed cotton will be ample.

*Spray Calender.* Under this title the best known remedies for insect enemies and fungous diseases common to orchard and garden plants, were treated according to the following plan: The common name of the plant is printed in black type in a column at the left hand side of the page; following this, a column states the name of the trouble (insect or disease) and in five subsequent columns the remedies, which have proven of economic value in treating this trouble, are arranged in the order in which they should be applied to the plant. Following this table are formulæ for the preparation of the standard insecticides and fungicides. This calender was very generally distributed to farmers, gardeners and fruit growers. An abridged revision of the calender also appears in the April (1900) issue of the Farm Review.

## SUGAR BEETS.

In 1898 the Experiment Station began the investigation of the sugar beet in West Virginia, and thereupon entered into a number of co-operative experiments with farmers of the state, for the purpose of determining the adaptability of West Virginia soils and climate to the production of this crop. Bulletin No. 55 of the station is a preliminary report on this investigation. The results of a number of analyses of the samples of beets grown by farmers and submitted, are shown, covering various counties of the State, and as a whole is a very encouraging report as to the possibilities of growing sugar beets in our state. The comparison between varieties of the beet, as well as of fertilizers upon the experiment station farm, are also reported therein, and careful instructions for the selection of the soil, cultivation, harvesting, etc., are made. The author of the bulletin has the following to say in this connection:

During the past year the Experiment Station at the suggestion of the United States Department of Agriculture, entered into co-operation with that Department for the purpose of studying the adaptability of West Virginia soils and climate to the cultivation of the sugar beet. The results of the work are given in the following pages and considered sufficiently encouraging to justify a continuance of the work during the coming season.

Farmers and others interested in sugar beets may care to know that a century and a half has elapsed since Mangraff first succeeded in extracting crystalized sugar from beets. From this humble experiment the refined methods and elaborate machinery of the modern sugar factory have been evolved. No less remarkable has been the improvements in the beets themselves, the sugar contents of which has been increased three or four fold. The beets that Margraff had to use in his investigations rarely contained over 5 per cent. of sugar, and so would not be regarded as profitable, even with the improved machinery of the present day. A suitable beet had to be evolved, and this required long years of patient, painstaking work. Just imagine the reception that would await the announcement of such results by an experimenter of the present day! He had succeeded in obtaining a few crystals of sugar from beets, but before these results could be of any "practical value," not only would the machinery of the modern sugar factory have to be created, but even the been the beets would have to be improved three hundred per cent. We mention this in passing because the profitable production of sugar from beets is pre-eminently the result of patient, painstaking investigations, and these, which like most other investigations that have been of any permanent value to agriculture, have passed through the period when their "immediate practical value" was not so easy to discover.

The humble experiments of Margraff started the long series of investigations and improvements resulting in the gigantic industry that has produced some millions of tons of beet sugar; an industry that has converted nations that had been paying out large sums of money annually for sugar, into heavy exporters of this commodity. It is with the hope that this nation may be able to produce the $100,000,000 worth of sugar now being imported annually, that the Department has taken up this investigation, and it is for the purpose of determining whether West Virginia can produce her share of this amount, that this Station has asked farmers to co-operate in this investigation.

The only question to be settled in this investigation is: Has West Virginia a soil and climate suitable to the production of beets of a quality to be used in the profitable manufacture of sugar? In pursuance of this object, in the spring of 1898, the Station distributed over different sections of the State, the seed of two improved varieties of sugar beets, namely Vilmorin and Kleinwauzlebener, and at the same time full directions were given for preparation of soil, cultivation, harvesting, etc. Later in the season blanks were forwarded to parties receiving the seed to enable them to report the results. Directions for taking samples, accompanied by franking tags for transmitting samples through the mails, were also sent. One hundred and ninety-eight packages of seed were distributed, and 125 samples of beets were received at the Station. Quite a number of the samples received were not labelled or marked in any way. It will, therefore, be impossible in such cases, to give the name of the grower.

In some of the reports the yield per acre was not given; in others the reported yields were so manifestly incorrect that no tabulation of this item will be attempted.

### FOREST INVESTIGATION.

*Bulletin No. 56*, published in April, 1899, which is a "Report on Investigations to Determine the Cause of Unhealthy Conditions of the Spruce and Pine from 1880 to 1893," consisting of 270 pages, is the result of special investigations conducted by the entomologist of the station in the spruce and pine forests of West Virginia, to determine the causes of the unhealthy conditions of the timber, which prevailed between 1880 and 1893, resulting in the death and total loss of many hundred thousand dollars' worth of the finest timber in the state. This investigation was begun in 1890 when great quantities of spruce timber was first observed to be in a dying condition in Randolph county. The indications were that the trouble was produced by insects, and consequently a general and systematic study of the conditions prevailing in the spruce forests of the state, as well as a study of the destructive, injurious and beneficial insects associated with the living and dead spruce was made a special feature of the work of the Entomological Department of the Station, and since that time it has received a large share of the attention of that department. Every facility was afforded the entomologist for a study of this question, and, aided by contributions from owners of such timber in West Virginia, the entomologist was enabled to visit Europe for the purpose of studying the natural enemies of the insect which was producing this injury to our West Virginia forests. We can not better present, in our limited space, the matter reported in this bulletin than by quoting the table of contents, as follows:

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In addition to this, we quote some short extracts, showing the method of illustrating this work under the headings of "The Spruce in West Virginia", "Common and Technical Names", "Description", "Distribution", "Some of the Early Disturbing Influences", "Mountain Pastures", "The Original Area Greatly Reduced", "Present Condition in the Spruce Area", "Probable Future of the Area as Indicated by Present Conditions", and "Commercial Influence in their Relation to the Future of the Spruce Area".

# THE SPRUCE INVESTIGATION.

## THE SPRUCE IN WEST VIRGINIA.

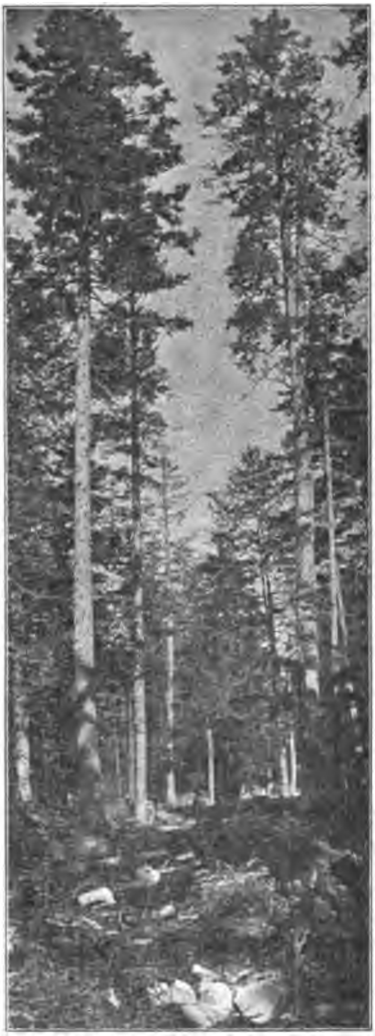

Fig. 1.—A typical specimen of the Black Spruce on left of picture, and soil in which it grows.

*Picea mariana.* (Mill) B. S. P.

Before entering into a detailed discussion of the results of investigations to determine the cause of troubles, which from time to time resulted in the death of great quantities of spruce timber, it seems desirable to give a review of some results of observations regarding the spruce, the areas occupied by it in the State, and the conditions which have from time to time contributed to its destruction.

### COMMON AND TECHNICAL NAMES

As is unfortunately the case with many of our common species of plants and animals, there has been much confusion, due to the many common and scientific names applied to the spruce of the Allegheny Mountains. It is known in different localities as pine, yew pine, spruce, spruce pine, hemlock, black spruce and red spruce.

It has also been described under a number of technical names, and there is yet some confusion regarding the correct name of the two nearly allied species, which are believed to occur in West Virginia. The common and large species is thought by some botanists to be the red spruce, *Picea rubens,* Sarg. while it is claimed by others to be the true black spruce, This confusion in common and scientific names is particularly, unfortunate as applied to this timber tree which was becoming generally recognized as black spruce by manufacturers, dealers and consumers of its valuable products. Probably the simplest and easiest way to remedy the confusion arising from change of names, of a common timber tree, is in this case simply to adopt the name of *spruce*, which will answer for com-

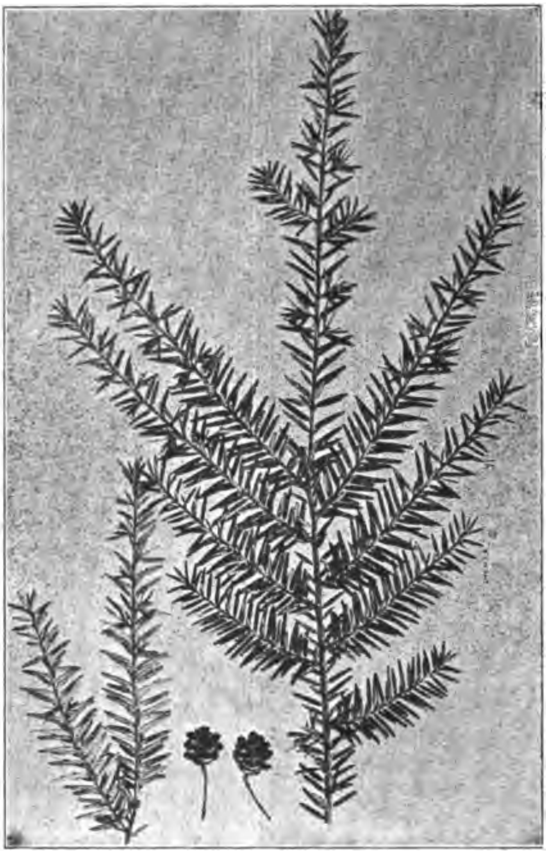

Fig. II.—Hemlock branches and cones, about one-half natural size.

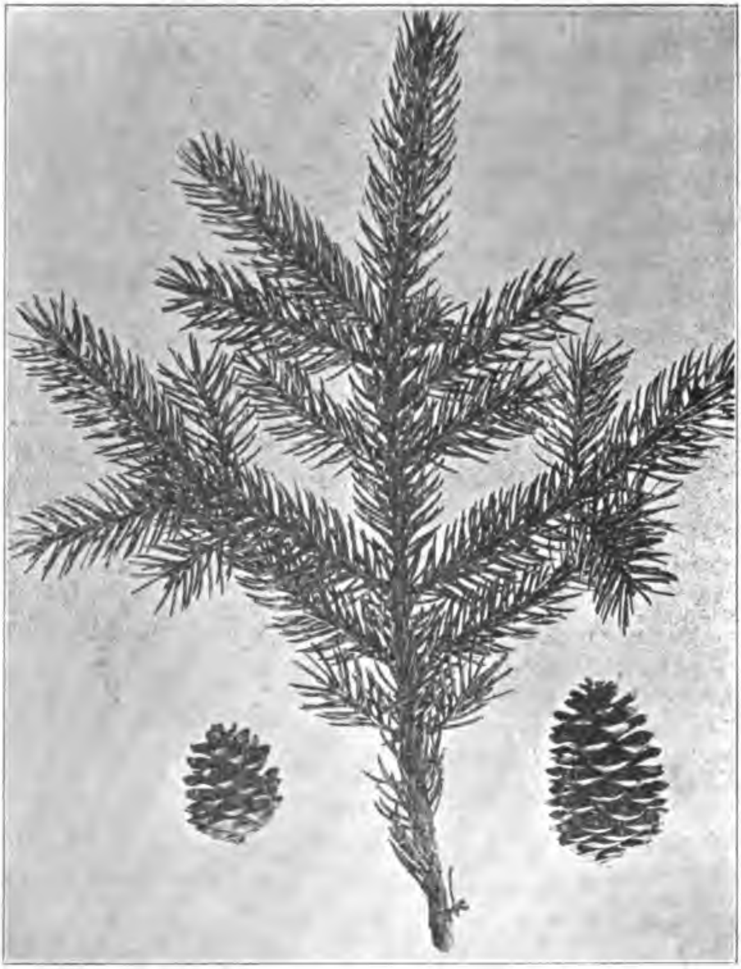

Fig. III.—Black Spruce branch and cones, about one-half natural size.

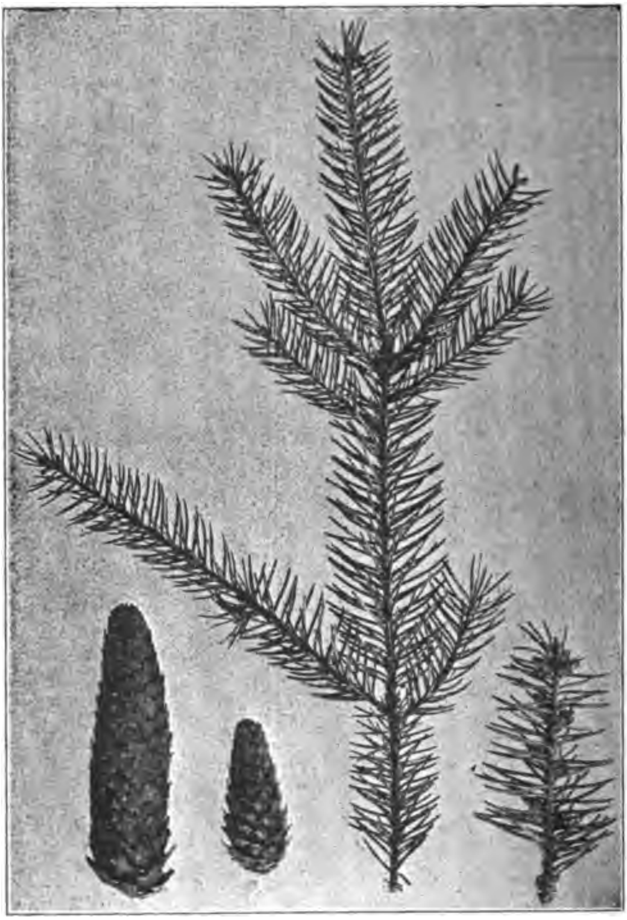

**Fig. IV.—Norway Spruce (*Abies excelsia*) branches and cones. About one-half natural size.**

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mercial purposes quite as well as the name black or red spruce, to indicate the only two timber spruce we have in the state, the products of which are nearly or quite alike in every respect.

It must be remembered that the spruce is quite a different tree from the hemlock, (Fig. II) which in sections where the true spruce does not grow is sometimes called spruce.

## DESCRIPTION.

The spruce (Fig. I) is easily distinguished from all of our timber trees by the following characteristics: It is a tall, straight tree, attaining a maximum diameter of two to three feet at the base, and a height of over one hundred feet. The cones (Fig. III) are one to one and three-fourth inches long, occurring singly or in clusters, most abundant at the top of the tree. The leaves are short and stiff, dark green and thickly set on the young branches, the larger branches usually extend at right angles to the main trunk and droop towards the tips, forming a conical top, resembling closely in this respect the introduced and cultivated Norway spruce, (Fig. IV). The wood is light and strong, although frequently filled with small knots. It is

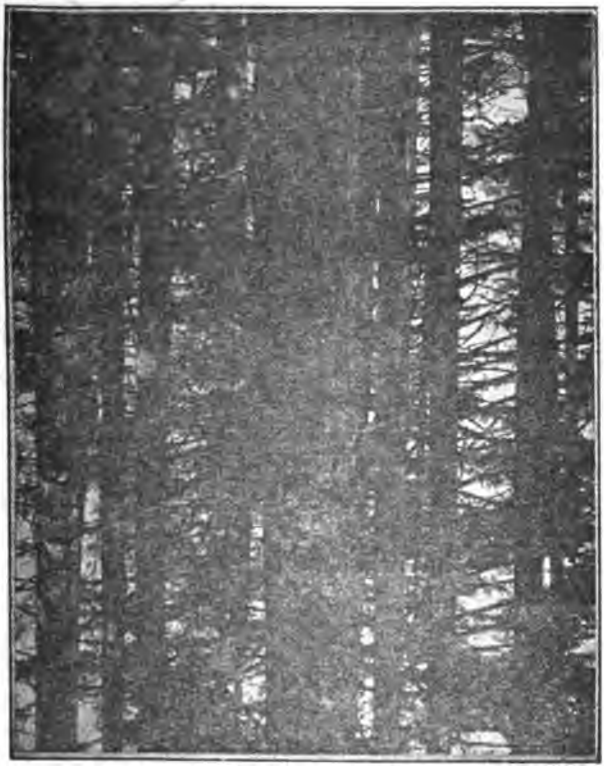

Fig. V.—Glimpse in a Dense Spruce Forest.

used principally for frame stuff, siding, inside finish and shingles, and is also largely used for the manufacture of high grade paper pulp. Whenever the conditions are favorable for the growth of this tree, it forms dense and nearly pure forests of fine timber, yielding from ten to fifty thousand feet, board measure, of lumber to the acre. It seems to thrive best on rocky slopes and ridges, and flat and swampy mountain plateaus. In rich, deep, limestone and clayey or sandy soils, even at high elevations, the conditions are unfavorable for it to form dense forests, Fig. V), since it is less capable of surviving in the struggle for existence with birch, maple, beach and other hard wood trees, which usually occupy such lands. It is, therefore, pre-eminently fitted to occupy land which is worthless for almost any other purposes. It is seldom found growing naturally in West Virginia below an elevation of 2,300 feet above the sea, and is most abundant at and above 3,000 feet. Indeed, the various species of spruce and fir, indigenous to the eastern part of North America, occur only at high elevations and in northern latitudes, becoming more abundant and forming great forests towards the sub-artic regions where, according to Sargent, they extend in a great belt across the continent. Therefore, they are distinctly northern in their general distribution, and can thrive naturally only in a cold climate like that prevailing in Central and North Canada, hence, it can only grow naturally in West Virginia at high altitudes where the climate is equal or similar to that of Canada. Indeed, its presence in mixed or pure forests in the state is an infallable index that a Canadian climate prevails, and that the area occupied by it is in the so called Canadian Life Zone, where other life, both plant and animal, common to a northern latitude, may be found.

## DISTRIBUTION.

It is evident that many thousands of years ago, when the great ice sheet covered the greater part of North America and extended nearly to the northern border of the West Virginia area, the spruce was widely distributed over the hills and mountains of the state wherever the soil conditions were favorable for its growth, but after the ice receded and the climate moderated it became restricted in its distribution to the higher elevations of the mountains, where, in the great struggle for existence, it maintained its supremacy over large areas. When the area began to be settled by white people, a disturbing influence was introduced which resulted in the destruction of vast quantities of the timber, and as a prevalent forest tree its range has been continually reduced until at present we find only a remnant of the primitive forests which once prevailed.

The spruce reaches its highest development and forms almost pure forests in Grant, Tucker, Webster, Greenbrier, Randolph and Pocahontas counties, where the Cheat, Valley, Greenbrier, Elk and Gauley rivers find their sources in the numerous small overflowing headwater streams. This remarkable area of river sources is suggestive of what is really found, namely: that the most favorable characteristic conditions for the prolific growth of the spruce, aside from a high elevation and consequent Canadian climate, is the superabundant moisture in the soil and air. The soil in many typical spruce forests is little else than a mass of broken stones, which is literally filled with water at almost all seasons of the year, thus rendering it possible for a heavy growth of large spruce trees to develop where there is apparently but little earth in reach of their widely spreading roots, (Fig. VI). In fact, I have observed many such places where, after the trees had been removed and the surface burned over, there was apparently not enough soil in a square rod to meet the ordinary requirements of a hill of corn.

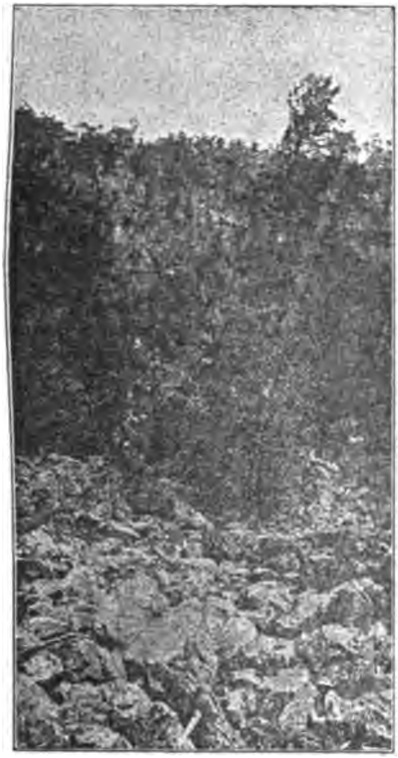

Fig. VI.—A rocky surface like that in which Spruce Timber grows.

Through the southern portion of Hampshire county, the central and eastern and western portion of Hardy, the central and eastern portion of Pendleton, through the eastern portion of Pocahontas, Greenbrier and Monroe, and in Summers, Fayette, Raleigh, Mercer, Wyoming and McDowell counties, we find areas of greater or less extent ranging in elevations from 2,400 to 4,000 feet above tide water, where it would appear that the spruce should be found in abundance, yet while it occasionally occurs here in typical forest growth over a few acres, it is, as a rule, when found at all, in this its eastern and southern limit, in the State, simply as a few scrubby individuals among the luxuriant growth of hardwood and white pine. The contrasting drier and warmer conditions of the air and soil through forest and open country of this region is, therefore, as compared with the spruce region proper, unfavorable for the growth of this tree in pure forests. It would appear, however, that when all of this Allegheny region af high altitudes was covered with an unbroken forest, as it doubtless was just prior to its settlement by the first white people, the more abundant moisture in the soil and atmosphere attending this forest-covered condition, made it possible for the spruce to occupy, as the principal growth all of these higher elevations which at present are covered with other kinds of timber. The area or belt in which the spruce was then found, probably covered all of the higher elevations of the Appalachian range that rise above 2,400 feet, which would be an area of about 2,000,000 acres, on which one-half of the timber was probably spruce. If so, there was about 1,500,000 acres of spruce forests here when the first white settler occupied the territory. Since that time there has been a gradual reduction from various disturbing influences. (Fig. VII.)

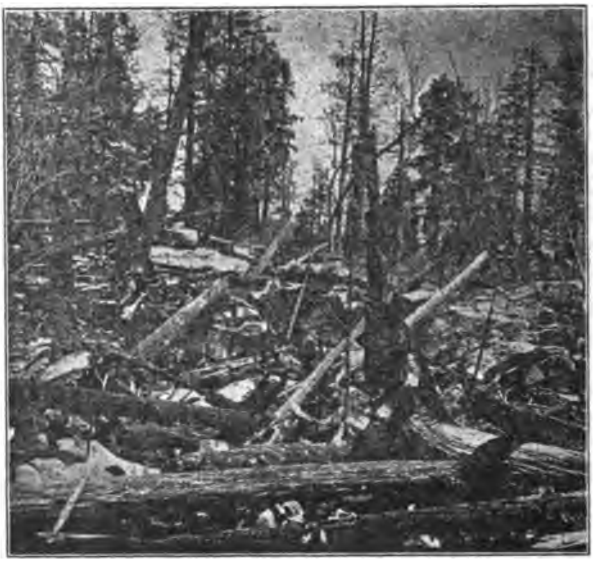

Fig. VII.—Spruce Forest, showing destruction by fire, and the rocky condition of the surface on which the trees grow.

## SOME OF THE EARLY DISTURBING INFLUENCES.

In a resume of the several influences which have tended to lessen this forest area to its present comparatively small proportion, we find that in addition to the destruction of the forests by man, insects have taken a prominent part. The changed conditions brought about by the early clearings of the fertile valleys of the Greenbrier, Potomac, James and Valley rivers, and the rich country in the southern end of the region, probably had the effect of materially reducing the humidity of the atmosphere and soil, and of exposing the more narrow and isolated mountain ranges of the eastern portion to drying winds, forest fires (Fig. VIII) and fierce storms. This naturally had the effect of weakening the vitality of the spruce, and together with extensive wind falls, of which we have some early records, the most favorable conditions were offered for the increase and destructive invasions of spruce infesting insects and other enemies of the forest, which within a few years—as we have had abundant evidence in the destructive invasions of the pine bark beetle—are capable of devastating the timber on hundreds of square miles. (Fig. IX.)

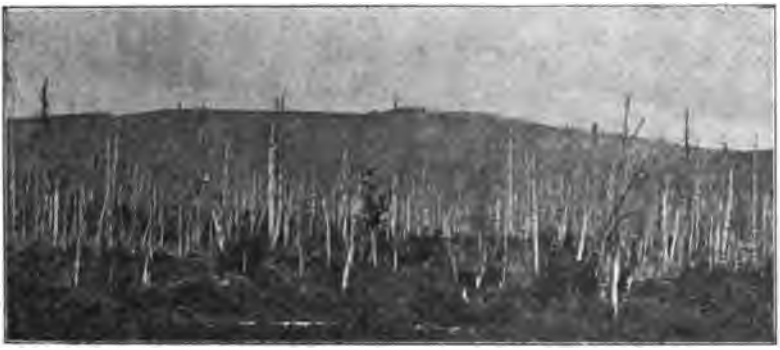

Fig. VIII.—Dead Spruce Timber in the Canaan Valley.

This natural process of destruction of timber by wind, by fire, by disease and by insects, was continued, varying in its extent, with the dry and wet, cold or warm seasons. To this was added the early and continued practice by Indian and white hunters, of burning over extensive areas to facilitate the procuring of game. Thousands of acres of these "hunter's burnings" may be found now in the heart of the spruce region, denuded of every vestige of timber. I have myself observed single sections of over a thousand acres thus denuded, upon which

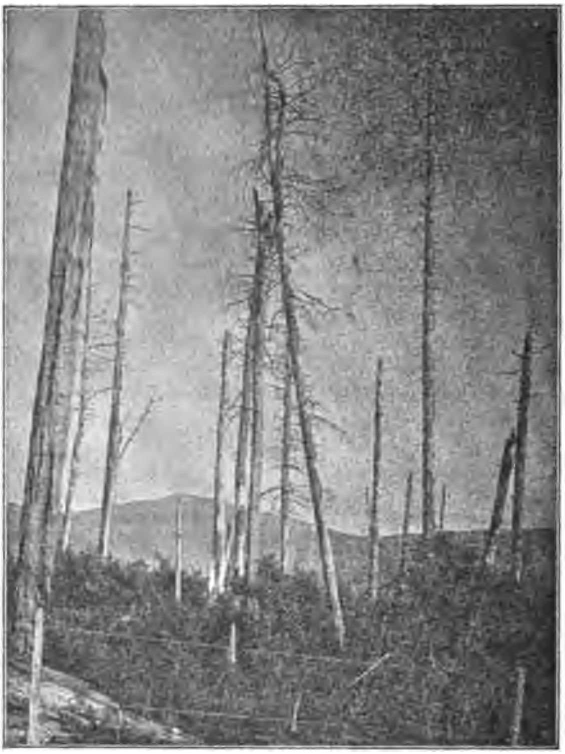

Fig. IX.—Remnants of a Great Spruce Forest, Canaan Valley.

there was not a trace, not even a stump of the dense forest that once stood on the ground, the greater portion of the surface being covered either with a thick mass of ferns, mountain blackberry or blue-grass.

## MOUNTAIN PASTURES.

Another destructive agency has been the clearing of large tracts in the midst of the wilderness of the spruce area by means of a system known as "hacking," for the purpose of obtaining pasture for cattle. (Fig. X.) Farmers living fifty to seventy-five miles distant from the fertile limestone regions throughout the eastern and southern portions of Randolph and northern portion of Pocahontas counties came into this spruce wilderness and purchased from the original owners, large tracts of

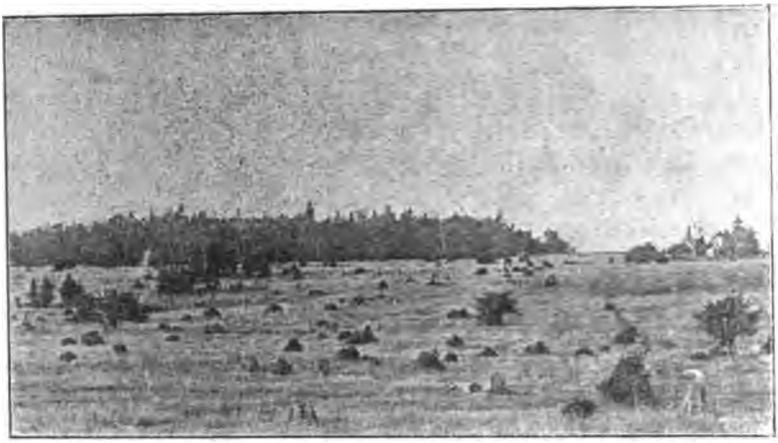

Fig. X.—Mountain Pasture with young spruce and white thorn, the latter pruned by cattle, altitude 3,000 ft.; near Pigeon Roost, Grant County.

land, paying 25 to 75 cents an acre for it, usually selecting the higher plateaus where, in addition to a fertile limestone soil, the land was reasonably free from surface stones. They would then proceed to girdle all of the timber on the best land and leave it to die. In a few years after the timber had been girdled these hackings were burned over to kill the undergrowth, and to get rid of the fallen timber: This was usually all that was necessary to make the conditions favorable for a natural growth of blue grass, which soon occupied the land. Then the cattle were driven into these mountain pastures, from the distant farms to be left in charge of a herder during the summer months. In the fall those suitable for beef were driven to market and the others returned to the farms. By these hunting and pastoral methods large sections where the best spruce grew have been denuded and a subsequent growth of timber prevented. (Fig. XI.)

## THE ORIGINAL AREA GREATLY REDUCED.

Thus, I would judge that the spruce area up to about the year 1865 has been reduced to a belt averaging about twenty miles wide and one hundred and eighty miles long, or an area of about 3,600 square miles, on which not over one-half of the total forest growth was spruce, or an equivalent to perhaps 750,000 acres of nearly pure merchantable spruce timber.

Within the last thirty years the spruce in this region has been greatly reduced by destructive insects, by fire, and by the lum-

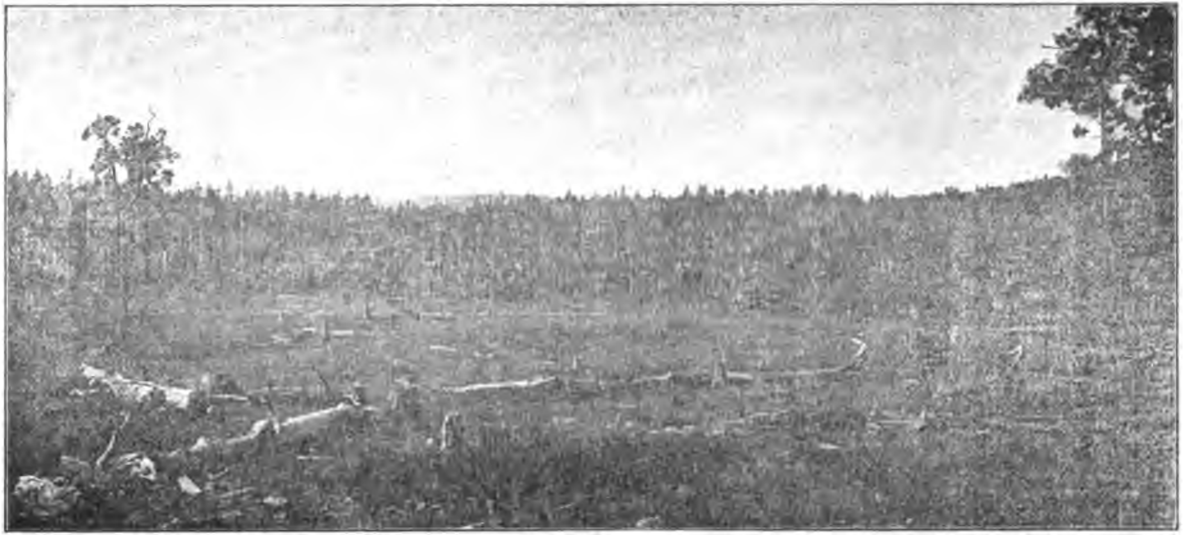

Fig XI.—Mountain pasture and Spruce Forest; altitude, 3,000 feet; near Pigeon Roost, Grant County.

berman until the total merchantable spruce timber now standing in the State in 1895 would not, according to my estimation, based upon original observations and accessible statistics, be equivalent to much over 225,000 acres of pure spruce forests, averaging 15,000 feet of lumber to the acre. While this may be considered a large amount of timber, it was a great reduction from the probable original 1,500,000 acres and the recent 750,000 acres. (Fig. XII.)

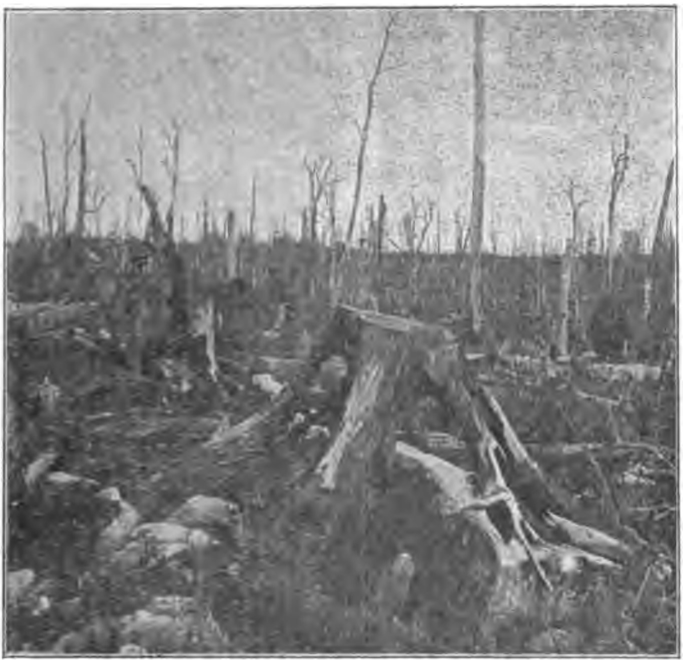

Fig. XII.—Spruce Forests cut over and destroyed by fire, near Davis.

A study of the present conditions in the Spruce Area is, in many respects, of especial interest, furnishing as it does a typical example of the influences exerted by progressive industry in the development of natural resources, upon the plant and animal life, climate, etc., and the consequent disturbance of nature's law in bringing about changed condition. The virgin forests of this area are mainly restricted to the more inaccessible portions of the rocky or swampy condition of the soil which has rendered them undesirable for pasture lands, unfavorable for the origin and spread of forest fires, or for the operation of lumber or timber companies. Thus we find sections of greater or less extent throughout the south-western portion of Mineral, western portion of Grant, the eastern portion of Tucker, Preston and Randolph, western portion of Pendleton and the north-eastern portion of Pocahontas county, and on the higher elevations of Webster and Greenbrier counties, where reasonably healthy and almost pure spruce forests occur. We also find in this same region areas from one to a thousand acres or more in extent on which all of the spruce timber has been killed by insects or other causes. Much of the timber is yet standing, however, and that which has recently died will remain in fairly good condition for the manufacture of timber and pulp for a number of years.

The spruce is the principal tree in the northern section of the area, while the other typical evergreen forest trees are hemlock (Fig. XIII.), white pine and balsam fir, and two or three other species of pines. The hemlock is abundant throughout the area, in some places occurring in pure forests, but, as a rule, mixed with spruce and hardwood. The white pine is common in the southern section, while the fir occurs only in the swampy plateaus of the southern portion of Randolph county. In the north-western edge of Preston there is a small area occupied with a mixed growth of spruce, larch and an occasional red pine. Among the deciduous trees which are classed with the hardwood, the birches and beech are the most common; the black cherry frequent, mixed with the spruce, and the soft and hard maples common, while the white and red oak and tulip poplar are frequent on lower elevations.

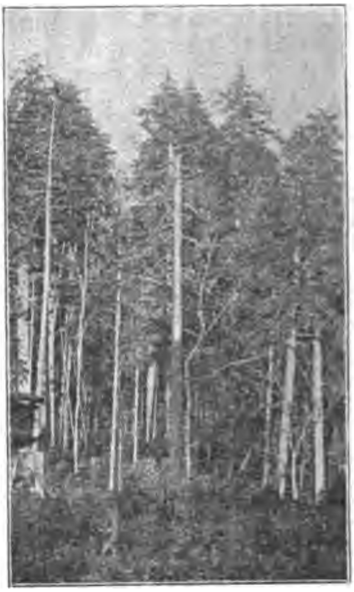
Fig. XIII.—The edge of a Hemlock Forest in Canaan Valley.

Within recent years extensive lumber manufacturing companies have removed the spruce and other timber from large sections in Mineral, Grant and Tucker counties, and on Dry and Shavers Fork of Cheat in Randolph county, and are rapidly extending their operations into the remaining primitive forests.

The greatly improved facilities for getting out timber and manufacturing it into lumber and pulp makes it possible for the several companies operating in this portion of the spruce belt to remove and manufacture the timber from thirty to fifty acres every day in the year.

With the improvements which enable them to handle this immense daily cut of timber there are also improved methods of preventing waste, and of utilizing all of the spruce, as well as the hemlock and hardwood, thus preventing the immense loss which would otherwise be caused by the almost inevitable conflagration that follows the extensive cuttings in these dense forests. It is now the practice of the principal operators to take everything in the way of timber in their path of operation that is of any value, and as soon as one section is thoroughly gone over, they push on to another. The logs and other rough materials are often transported many miles from different directions to the central manufacturing point, by means of log trains on narrow and broad gauge railroads, which are built at great expense for this purpose. In some sections, notably on Shaver's Fork of Cheat, the logs are transported from mountain sides and summits by means of log slides. (See Fig. XIV.)

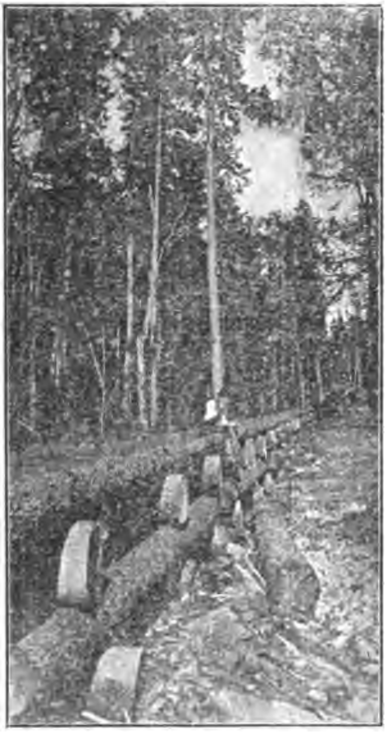

Fig. XIV.—Log Slide, extending from top of mountain to Shaver's Fork of Cheat.

Thus, in worked-over regions we find the first year a labyrinth of log roads, log slides and railroads through the standing laurel; and between immense piles and windrows of spruce tops, old logs; broken trees and brush, a perfect harbor and hot-bed for myriads of wood and bark infesting insects. The species of insect that would otherwise attack the living timber are attracted to the more inviting, recently felled trees and tops found here and to the partly green stumps where they breed and multiply, and in turn furnish abundant food for their natural enemies. Many kinds of the bark and wood infesting species which develop broods of young the first season, migrate to fresh cutting, where they are followed by their enemies, while those that are more tardy in their developments remain in the old cuttings until the following year, before they emerge, or they are caught by the fire, which sooner or later claims this mass of inflammable rubbish.

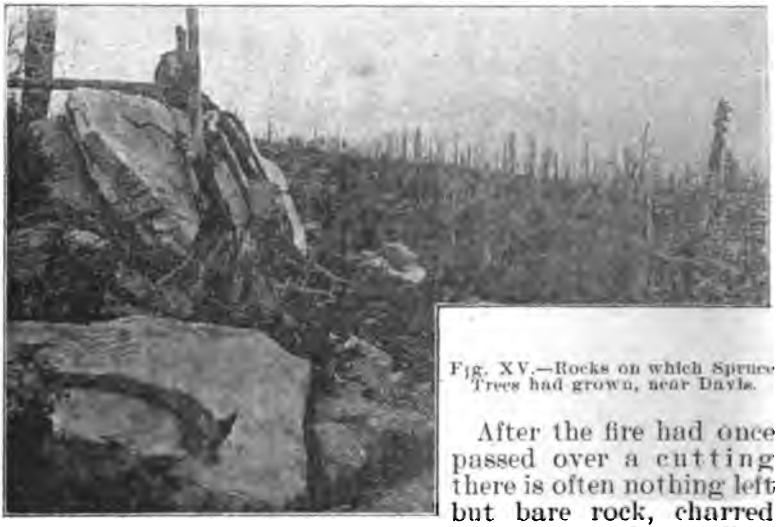

Fig. XV.—Rocks on which Spruce Trees had grown, near Davis.

After the fire had once passed over a cutting there is often nothing left but bare rock, charred stumps and logs, (Fig. XV). presenting a most desolate appearance in contrast with the previous luxuriant growth.

The future condition of areas thus cut and burned over varies with the quality and condition of the land, and the frequency or non-occurrence of fires. In some sections where large areas present simply a mass of broken stones, no vegetation, except, possibly, a few struggling fire weeds and brambles, or a scrubby growth of fire cherry[1] can survive. In other sections where more soil is mixed with the stones, and the land is undulating or level, fire or other weeds will spring up the same, or the following year, after the land has been burned over. These are succeeded by the growth of thornless blackberries, fire cherry, birch, etc., with possibly a few spruce and hemlock. If such places are protected from fire, the worthless fire cheery usually takes possession of the entire surface and crowds out everything else. Where the soil is of a better quality a growth of spruce, birch, hemlock and sugar maple will follow the weeds and briars, and if protected from fire may produce a second growth of valuable spruce and other timber. In sections where the land is of good quality and well drained, and has been burned over a few times, a luxuriant growth of blue grass will spring up and take possession of the land, especially if stock is allowed to run over it. In other wet and poorer sections the land will be covered by a dense growth of large ferns.

Therefore, under existing conditions, there appears to be poor prospects of these worked and burned over areas ever producing, naturally, a profitable growth of timber. With a little care and systematic management, however, much of the land which is absolutely worthless for anything else of value, could be made to produce a dense growth of spruce (Fig. XVI), and other timber, which would, within 25 or 30 years, begin to yield profitable returns in pulp wood, and in 50 to 100 years it could all be cut for pulp and lumber.

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[1] *Prunus Pennsylvanica L.*

The typical spruce or pine forests in the southern, eastern and southeastern portions of Randolph, and in Pocahontas, Webster, and Greenbrier counties, are in fairly healthy condition, and have not, as yet, been invaded by the lumberman. Preparations are being made, however, to commence operations here at an early date, when the same results as those we have mentioned are almost certain to follow.

### PROBABLE FUTURE OF THE AREA AS INDICATED BY PRESENT CONDITION.

Tracing the history of the spruce

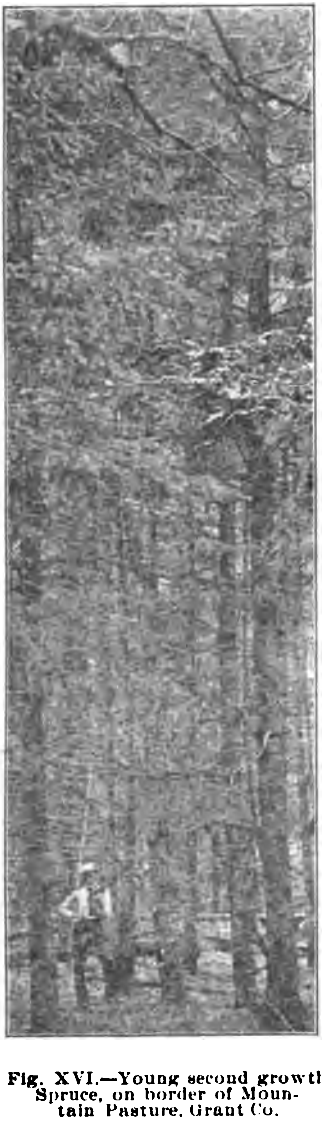

Fig. XVI.—Young second growth Spruce, on border of Mountain Pasture, Grant Co.

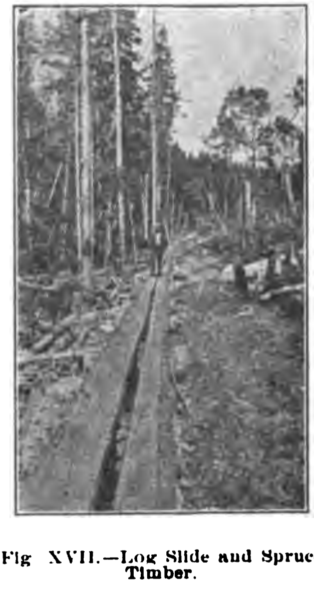

Fig XVII.—Log Slide and Spruce Timber.

from the time when it possibly held undisputed possession of nearly all of the West Virginia area, through its struggle along with the other hardier evergreens, to hold possession during the ice age, its efforts to occupy the land left by the receding waters,[1] its struggle for existence with the hardwoods and pine, and its final retreat to the higher elevations where it occupied the land previously held by the more hardy spruce and firs, and while those that remained on the lower elevations were giving up the land to the victorious oak, yellow poplar, birch and hemlock, the main body of the spruce finally held its own on the higher elevations until the advent of civilization, when it found a new enemy in man, and through his influences in clearing the land, in the resulting forest fires and insect invasions, we find it reduced to its present narrow bounds and mutilated condition, it would appear that this remnant and living example of the greater primitive forest is destined to follow the prehistoric races of men and animals which have long since been banished from the land.

Whether or not this theory of the history and progress of the destruction of the spruce is correct, it is at least suggestive of the probable truth, and will indicate what its future will be unless the same influences, through the agency of man which have brought about the greatest recent destructions, are controlled and directed so as to bring about reversed results. Still further evidences of the possible future condition of the region may be had from the history of similar regions in some of the older countries of Europe, where a continued system of destruction of forests with no attempt at systematic protection, or renewal, has resulted in the transformation of rich and productive regions into desert wastes, and has in some cases even contributed to the reduction of powerful and prosperous nations to a condition of dependence and poverty.

We also find abundant records of other examples in the forest regions of Europe, where by a judicious and economic system of management the timber on similar areas has been increased and its productive capacity doubled, and at the same time has furnished continued and profitable returns in merchantable products. As a consequence, the country maintaining such a system has made rapid advancement in all of its industries, and become influential and prosperous.

History will doubtless repeat itself along one or the other of these lines in the spruce area and other typical forest areas of our State. Which one will be followed, and what the final results will be, depends:

First—Upon further investigations within the near future by a commission of scientific and practical observers who are especially fitted for the purpose, to determine biological, geological, agricultural, horticultural, commercial, meteorological and entomological questions which have a direct bearing upon the conditions and needs of this and other distinctive forest areas of the State.

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[1] According to Dr. I. C. White, a large part of the low lands of the State was inundated during the ice age.

Second—Upon the interest the owner of the land and the general public will take in an effort to introduce some practical system of forest management, and the aid and encouragement a movement of this kind will receive from them.

Third—Upon the additional aid and encouragement the State or general government will extend in furthering the objects of such movements.

Fourth—Upon the individual owners of the land and the object and interest they may manifest in the immediate or distant future; whether through necessity or otherwise, they deem it important to avail themselves of present opportunities, and realize, to the fullest extent, on their investments, regardless of future consequences; or whether through an interest in posterity, in the welfare of their State, or in future profits, it is their object to perpetuate the wealth they possess in natural forest resources.

## COMMERCIAL INFLUENCE IN THEIR RELATION TO THE FUTURE OF THE SPRUCE AREA.

The cutting of timber to be converted into mercantile products, the clearing of land for the purpose of obtaining merchantable agricultural products, the opening of coal, iron and other mines, the improvement of streams and the building of railroads for the transportation of these various natural products to market, is exerting a marked influence upon the destruction of the spruce. (Fig. XVIII.)

The conversion of the forests into merchantable products appears to be if not a necessary evil, an unavoidable one. Capital represented by corporations, companies and private individuals has been invested with a view of realizing early profits on a greater part of the land covered by forests in this area. Numerous large manufacturing plants have been located at different points within the area, which, together, with others at a distance in this and other states are dependent upon the forests here for their raw materials. The capital invested in land and timber manufacturing plants, working force and transportation facilities is enormous, and as a necessary consequence these investments must be kept actively employed in order to yield an interest and profit on the investments. Thus, the demand upon the forest resources is correspondingly great, and under present conditions must be supplied regardless of future consequences to the land or the State.

This is the existing conditions which, I believe is not fully realized by persons who are considering the subject of how the

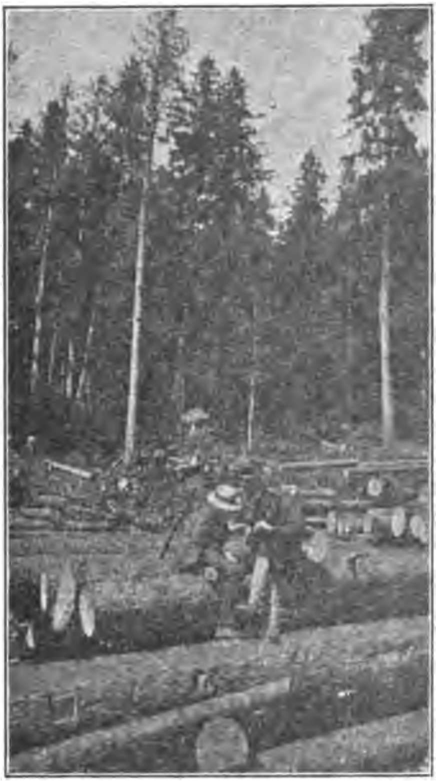

Fig. XVIII.—Spruce timber, skidway and log slide near Cheat Bridge, Randolph county.

destruction of our forests may be prevented. It appears to me to resolve itself into questions of how long the timber will last, how may present losses from insects, fire, and other causes be prevented, and how can the loss of these forests be best repaired?

*Bulletin No. 57*, on the subject of Commercial Fertilizers, is purely an official report as required by the statute, with a discussion of such incidental questions as relate thereto.

*Bulletin No. 58*, entitled "The Effect of Pressure in the Preservation of Milk", is a preliminary report of an investigation that has been under way several years. The prime object of this investigation is to discover, if possible, a method for preserving milk in good condition long enough to be shipped by freight from any point in the State to any of the eastern markets. The following is from the first page of the bulletin:

The souring of milk being due to the action of bacteria, methods for preserving milk must either destroy the germs or interfere with their work. Barring anticeptics, which are always objectionable, the methods in general use are reduced to three: sterilization, cooling and pasteurization. The first named method attempts to kill all the germs by heating the milk to about the temperature of boiling water, and keeping it at that temperature generally for about half an hour each day for three or four successive days, or by heating it to a somewhat higher temperature for one longer period. Sterilized milk should keep indefinitely, but it has a "cooked odor and taste. The second method makes no attempt to kill the germs; it simply prevents their rapid multiplication and so interferes with their action. It has one great advantage, in that it does not affect, injuriously, the odor, taste, etc., of milk. Pasteurization, which is a sort of compromise or combination of the other two methods, and consists in heating the milk for ten to thirty minutes at a temperature of 140° to 180° Farenheit, and then quickly cooling it, greatly reduces the total germ content of milk, and seems to be particularly effective in destroying the disease germs so often present. This method has many advantages, but as it does not kill all the germs, the milk must be kept at a low temperature, or it will sour in a very short time.

But one of these methods attempts to completely sterilize the milk, and it has a bad effect on the odor and taste of the milk. It will be observed that these methods, in general use, are all simply matters of temperature, and it would seem that in the problem of preserving milk the effect of temperature has been pretty well worked out, and that it might be worth while to study the effect of some other agent.

The agent studied was pressure, and the report is devoted to the methods and apparatus which had to be devised for applying the pressure, and to its effect on the keeping qualities of the milk. Of course the first question to be settled was whether by means of pressure the souring of milk can be prevented for a sufficient length of time, and this question has been settled. Pressure will prevent the souring of milk, but no sooner was this point determined than it was discovered that other very slight changes can take place in spite of the pressure. These changes take place very slowly and, ordinarily, long after the milk has soured, and so are concealed by the souring. When the souring is prevented by the pressure these other slight changes are observable and make their appearance in time. The souring of milk, however, is by far, the most important change and to be able to control it by such a simple method is certainly a long step towards the solution of the problem. The station people are confident they can control these remaining slight changes, and in view of what they have already accomplished it would seem that this ought to be a comparatively easy matter.

This investigation has involved a great deal of work of a high order. The problem is one of immense importance to the agricultural interests of a state so richly endowed with every thing that soil and climate can contribute to the dairy industry. The method of attacking the problem is thoroughly original from start to finish, and that those in charge of the work are as thoroughly in earnest about it is evident from every page of the bulletin referred to.

The work has attracted a great deal of attention and has received many encouraging criticisms from dairy, agrieultural and scientific journals generally. In fact, this is the kind of work for which experiment stations were originally designed, as it is the kind of work which the farmer, for want of necessary laboratories and equipment (to say nothing of the time and opportunity), can not do for himself.

At odd moments, while the above work was going on, the effect of pressure in the preservation of meats and fruit juices has received considerable attention, as will be seen from the following paragraph from the Twelfth Annual Report:

Samples of beef sealed up in the tin tubes and subjected to a pressure of thirty tons for as many minutes, at a temperature of 50 degrees C., and then allowed to remain unopened at the temperature and pressure of the laboratory, were found to be in very good condition, at the end of seven months, possessing no abnormal odor or other evidence of decomposition. That the pressure used was very largely responsible for these results was shown by the fact that samples of the same meat receiving like treatment in every respect except the pressure were living masses of germs at the end of two weeks and possessed an odor that was simply unendurable.

The best results were probably those obtained in working with grape juices, although these received the least attention. It was soon found that even a low pasteurizing temperature injured the delicate ffavor, so attempts at a combination of temperature and pressure were abandoned. It was found, however, that a pressure of ten to fifteen tons at ordinary temperatures would prevent fermentation if applied for ten or twelve days to the fresh juice. The pressure was then relieved and the samples allowed to remain at ordinary room temperatures and pressures. Of course, they were kept securely sealed. When opened three months later the purplish coloring matter had collected in a few small flockulent masses, leaving the juice perfectly clear and about the color of the pulp of the grape, but no other change had taken place that could be detected by the acidity, the specific gravity, the polariscope or the taste, and the samples possessed all the inimitable odor of the fresh grape juice.

*Bulletin No. 59*, published in June, 1899, on the subject, "Whole Corn Compared with Corn Meal for Fattening Hogs", is the result of experiments conducted and in 1897 and 1898 on that subject. In part the author says:

The practical question often arises whether it will pay a farmer to go to the trouble and expense of grinding his corn before feeding it to his hogs. Even though somewhat more pork may be produced by feeding corn meal, yet this increased gain in weight may be obtained at a financial loss, and it may be better to feed the whole grain, even though less pork is produced. To answer this question a series of experiments were planned, the first of which is here reported.

Experiments for determining the value of soaked corn as a food for fattening hogs were also carefully worked out and the results published in this bulletin.

*Bulletin No. 60*, on the subject, "Poultry Experiments", is the published results of two years' work with poultry. It includes a series of experiments begun in 1897 and continued for a number of periods of thirty days each. The principal questions which were studied are as follows: The effect of nitrogeneous and carbonaceous rations when fed to laying hens; second, the influence of floored versus unfloored pens on poultry, and, third, the effect of age of fowls upon egg production. Incidentally thereto a study was made of the effect of food upon the hatching of the eggs and many interesting and valuable conclusions are drawn from the investigation, in connection with which the author has the following to say:

### CONCLUSION.

Although the nitrogenous ration cost slightly more money, yet it was more profitable because more eggs were laid and the fowls gained more in weight. The eggs from the nitrogenous fed fowls were larger, more fertile, and hatched better and produced far more vigorous chicks than those laid by hens fed the carbonaceous ration. Both lots of fowls remained in a healthy, vigorous condition during the entire test.

*Bulletin No. 61*, published September, 1899, entitled "Sheep Feeding Experiments," is upon a subject of great interest, and the investigations reported therein are worthy of the attention of those engaged in breeding and feeding sheep. In this bulletin the author says, in part:

"A large portion of the lambs which are raised in West Virginia for the production of mutton, are marketed in the fall, and although this is undoubtedly the simplest way of disposing of the surplus lambs, yet this practice possesses some serious defects, for when animals of any kind are constantly being sold from a farm, with now and then some hay or grain, the fertility of the soil is continually carried away, and unless commercial fertilizers are employed to supply the deficiency of potash and phosphoric acid, the productiveness of the land must constantly diminish. On the other hand, if these lambs can be profitably fattened during the winter, they may be made to consume the clover hay, or other coarse fodder of the farm which has only a small commercial value. Also the farmer is enabled to feed his grain at home instead of being obliged to draw it several miles to the railroad station. In addition to the grain which is raised upon the farm, some of the concentrated feeding stuffs, such as cotton seed meal, linseed meal, or wheat bran, can generally be used to advantage in the fattening ration, and as each of these materials contains a large quantity of nitrogen, phosphoric acid, and potash, which is recovered in the manure, it is seen that when the policy of feeding the lambs during the winter is intelligently carried out, that the land will gradually become richer instead of poorer, because more fertility will be added by the manure than is carried away by the lamb crop.

"Although the theory is very clear regarding the matter, the practical question arises, can the ordinary farmer in West Virginia actually make a profit by feeding the common, native or grade lambs heavily with grain for eight or ten weeks during the winter, and if this is the case what is the best and most economical grain ration? In order to begin the study of these questions, and acquire some reliable data, a series of experiments were planned, the first of which is here reported.

"The corn-fed lot brought us in more clear money; but the manure from the lambs fed the nitrogenous ration was so much more valuable that the two lots gave practically the same profit. Perhaps better results might have been obtained if a small quantity of the linseed meal had been added to the whole corn ration.

"Although definite conclusions should not be drawn from one experiment, yet this feeding test indicates that lambs can be fattened more profitably than yearling wethers, and that under favorable conditions, it may be better for farmers who have an abundance of coarse fodder, to feed their lambs heavily for eight or ten weeks, instead of selling them at the usual time in the fall.

"It also indicates that forage and grain produced upon the farm may be sold at home for a higher price than the market offers."

The present equipment at the Station Farm will greatly facilitate experiments upon feeding sheep and swine, it being the intention of the management to promote such investigations far more in the future than ever before.

*Bulletin No. 62.* "A Study of the Effect of Incandescent Gas Light on Plant Growth." From the earliest records of man's contact with plants, the influence which *light*, of one kind or another, has upon plant growth has always been an interesting and fruitful subject for study. During recent years numerous experiments, with various artificial lights, have engaged the attention of students. The great preponderance of work has been done with one form or another of the electric light. In all cases marked effects of this kind of artificial light have been observed. As is usual the popular reader fell into the error of attributing these results to electricity, which is not true, except in an indirect way as a *source* of the light; but the belief exists that the electric light alone among all other forms of artificial lights is capable of acting beneficially, or otherwise, upon growing plants.

The studies entered into by the Experiment Station with the incandescent *gas* light conclusively prove that it is a question of light of a certain quality, regardless of its source. Many other interesting physiological questions are touched upon regarding the rate and periodicity of plant growth; the modification of the flowering habit, as well as the chemical composition of plants subjected to various quantities of light. Perhaps one of the most interesting practical deductions growing out of the work in this connection is that upon the sugar content of beets in the light, and those under normal conditions. The deductions are of sufficient interest to warrant reproduction here:

### SUGAR BEETS.

The sugar beet studies in the United States have clearly shown that certain areas, either because of atmospheric or soil conditions, are much better suited to the development of sacharine matter in the beet than others. In most cases the localities producing beets with greatest sugar content have been in high latitudes where short growing seasons are the rule and where the sun shines with great intensity for days uninterrupted by cloud or fog. These facts lead the writer to subject the sugar beet to the influence of the artificial light to see if it, like sunlight, would influence the growth or sugar content of the beet. Two deep beds were constructed in the greenhouses, one in the light house and another in an adjoining house where the light was not used. Great care was exercised to have all conditions except that of *light* alike. The soil for both beds was thoroughly worked over upon a mixing floor and was then divided into two lots, one being placed on the bench in the light house, while the other half was put in the normal house.

Seed from a common lot was sown March 27, 1899, in each bed. From the time of appearance above ground one lot was exposed continuously to the artificial light at night, while the other was kept under normal conditions. Growth was good, and on June 12 the plants of the light house were as shown in Fig. 9, and the normal, Fig. 10. While average individual plants from each bed showed the difference recorded in Fig. 11, in which "a" is normal and "b" light house.

On August 28 the leaves of the plants had become badly affected with the "leaf spot"[1] and the product of each plant was harvested. Eleven plants from each plat were selected as types of their respective plats and photographed with the difference shown in Figs. 12 (light house) and 13 (normal house). From these the 10 largest were selected for weight and analysis. The weight is recorded in the accompanying table which sufficiently explains itself:

---

[1] *Cercospora beticola*, Sacc.

## WEIGHTS OF SUGAR BEETS.

| Normal House. | | | Light House. | | |
|---|---|---|---|---|---|
| Gross Wt. | Wt. of Roots. | Wt. of Tops. | Gross Wt. | Wt. of Roots. | Wt. of Tops. |
| 8.5 lbs. | 6.15 lbs. | 1.35 | 4.775 | 2.0 | 2.775 |
| Av. .85 lbs | .615 | .0135 | .4775 | .20 | .2775 |

The average difference in weight of gross beet .3725 lb. in favor of normal conditions; in weight of roots .415 lb. in favor of normal, and .0425 lb. difference in weight of tops in favor of *light* grown plants.

The records in this table are certainly striking in the difference in weight shown between the two plats, in fact the difference was much more than was anticipated from conditions so nearly identical.

## CHEMICAL ANALYSIS OF SUGAR BEETS.

| Lot. | No. Beets. | Total Wt. Uncapped | Total Wt. Capped. | Per Cent. Sugar. | Per Cent. Purity. |
|---|---|---|---|---|---|
| Normal | 10 | 99.0 grms | 62.2 | 6.69 | 5.53 |
| Light. | 10 | 31.2 | 19.5 | 8.35 | 6.10 |

While there was a marked increase in size and weight of root as shown both by photograph and weights, in the normal over the light house beets, yet a chemical determination of the sugar contents of the two samples shows very strikingly that the light influenced the sacharine matter in the root to a marked degree. This is conformation of the theory advanced in the introduction to this experiment.

While growers who have given close attention to the behavior of beets in the northwest as compared with those in more easternly and southernly localities are fully aware of the differences shown by chemical analysis. I know of no other tests which have been carried out to show the influence of light upon sugar contents.

It is gratifying to be able to bring direct experimental proof in support of the light factor of the climatic conditions of the northwest in producing an increased sugar content of the beets grown in localities where intense sunlight prevails during a great part of the growing season. The result of this test emphasizes the stimulating effect of the light on top-growth as compared with root-growth. Table of "weights", page (100), is emphatic on this point. In all respects save that of total weight of top, the normal house beets outweighed the light house plants, but in this respect the table is turned and the balance falls in favor of the light plants.

## PLATE V.

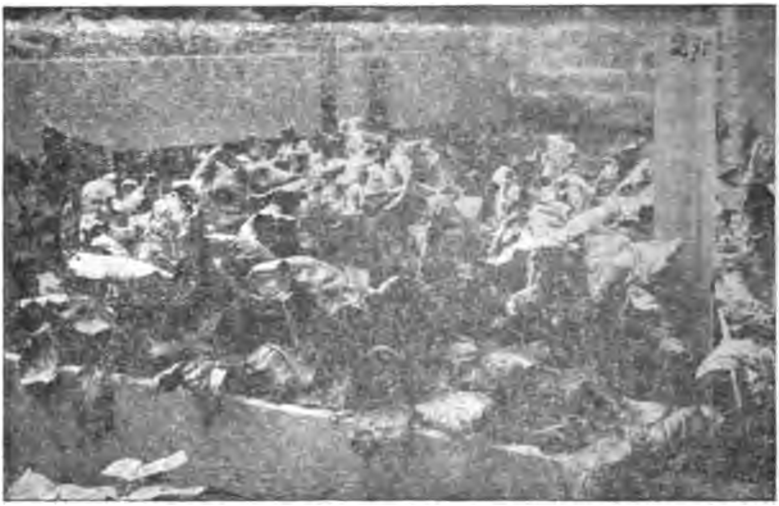

FIG. 9.—Sugar Beets, Light House.

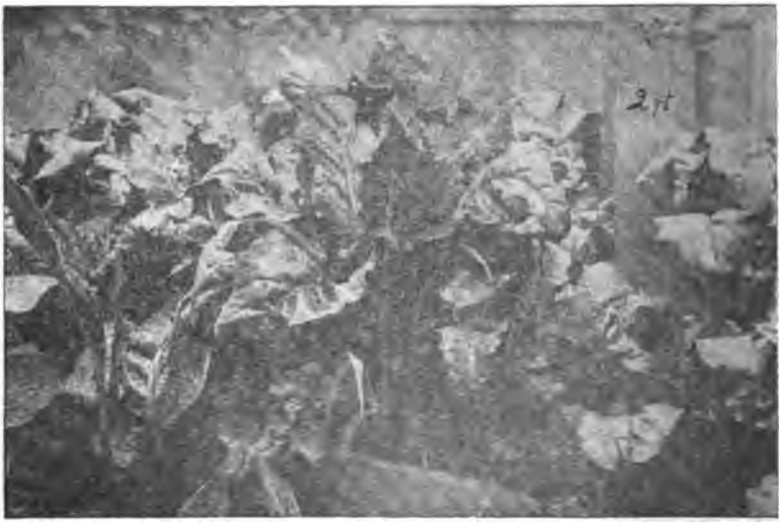

FIG. 10.—Sugar Beets, Normal House.

## PLATE VI.

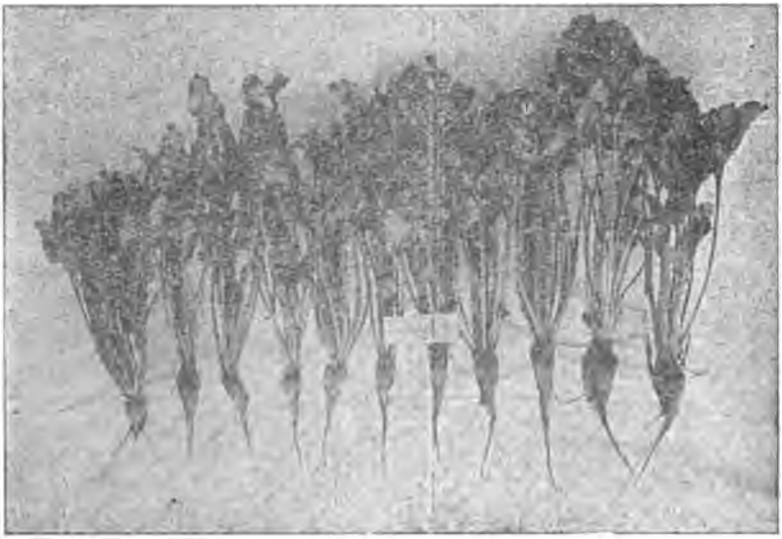

**Fig. 12.—Sugar Beets, Light House.**

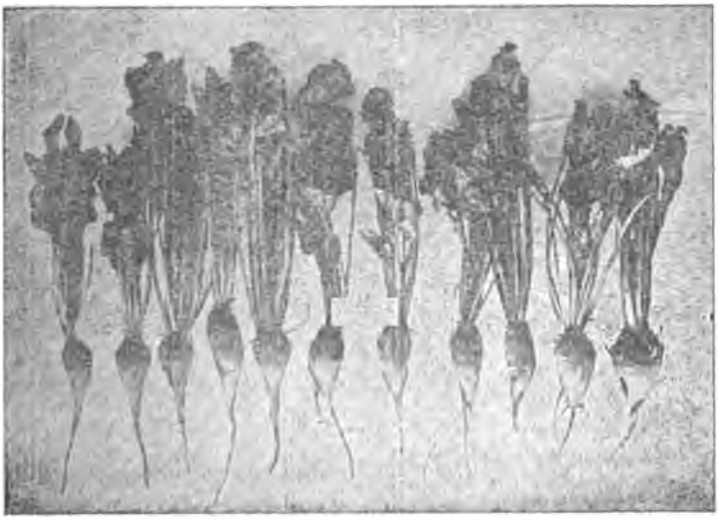

**Fig. 13.—Sugar Beets, Normal House.**

In *Bulletin No. 63*, a report on the work of commercial fertilizer, in addition to the regular official matter therein reported, the following matters which are well worthy of notice and study are discussed:

# REPORT OF THE WORK ON COMMERCIAL FERTILIZERS, FOR THE YEAR ENDING DECEMBER 31, 1899.

During the past year 204 brands of Commercial Fertilizers were submitted by manufacturers for registration in this State. This exceeds the number registered in any previous year by 32 brands, or more than 18 per cent. Of course, it does not necessarily follow that the sales increased to the same extent, but the tags issued during the year show that the sales have increased even more rapidly than the brands. The sale of tags would indicate that 39,106 tons of fertilizers have been shipped into the State during the past year, which according to the Station's valuation should have retailed at $771,672. This exceeds the sales of last year (which were heavier than those of any previous year), by more than 7,000 tons, $164,000 and 23 per cent.

Similar data in regard to the quantity and approximate value of all classes of Commercial Fertilizers sold in the State during the last five years will be found in Table I.

It should be borne in mind—1st, that the valuations given in this table are all based on the prices of materials at the time the fertilizers were on sale; 2d, that all figures are based on the number of tags issued, which must always fall short of indicating the total sales, as large quantites of special mixtures are shipped directly from the manufacturers to the consumers and do not come under our supervision, so the figures given are probably all very conservative, although at the present rate of increase the year 1900 will find them very near the million dollar mark.

## TABLE I.

Quantity and value of commercial fertilizers sold in this State during the last five years, as estimated from the sale of tags and the Station's valuations.

| CLASS. | Year. | Number of tons sold. | Part of total sales for the year. | Approximate value (retail). | Average price per ton |
|---|---|---|---|---|---|
| Acid Phosphates | 1895 | 11,252 | 52.19 p. ct | $176,826 | $15.72 |
| | 1896 | 12,447 | 43 77 “ | 199,148 | 16.00 |
| | 1897 | 18,728 | 50.40 “ | 221,809 | 16.16 |
| | 1898 | 15,169 | 47.71 “ | 241,201 | 15.91 |
| | 1899 | 18,172 | 46.47 “ | 801,559 | 16.60 |
| Acid Phosphates with Potash | 1895 | 1,400 | 6.49 “ | 25,238 | 18.08 |
| | 1896 | 2,598 | 9.14 “ | 45,845 | 17.65 |
| | 1897 | 2,868 | 10.51 “ | 49,504 | 17.29 |
| | 1898 | 8,988 | 12.24 “ | 66,988 | 17.21 |
| | 1899 | 6,549 | 16.75 “ | 118,583 | 18.10 |
| Complete Fertilizers | 1895 | 6,782 | 81.46 “ | 165,842 | 24.45 |
| | 1896 | 10,088 | 85.46 “ | 235,528 | 23.36 |
| | 1897 | 8,097 | 29.78 “ | 194,489 | 24.01 |
| | 1898 | 10,448 | 82.85 “ | 242,568 | 23.23 |
| | 1899 | 11,845 | 29.00 “ | 276,996 | 24.82 |
| Ground Bones | 1895 | 1,815 | 6.10 “ | 87,891 | 28.81 |
| | 1896 | 2,675 | 9.41 “ | 77,509 | 28.98 |
| | 1897 | 1,418 | 5.21 “ | 89,121 | 27.58 |
| | 1898 | 1,895 | 4.89 “ | 88,760 | 27.78 |
| | 1899 | 1,970 | 5.04 “ | 45,221 | 24.49 |
| Acidulated Bones (and a few miscellaneous materials | 1895 | 810 | 8.76 “ | 18,808 | 17.05 |
| | 1896 | 680 | 2.22 “ | 16,635 | 26.40 |
| | 1897 | 1,180 | 4.15 “ | 27,293 | 24.15 |
| | 1898 | 892 | 2.81 “ | 17,415 | 19.52 |
| | 1899 | 1,070 | 2.74 “ | 26,815 | 24,60 |
| Totals of all Classes | 1895 | 21,559 | 100.00 “ | 419,605 | 19.46 |
| | 1896 | 28,488 | 100.00 “ | 574,665 | 20.21 |
| | 1897 | 27,288 | 100.00 “ | 532,165 | 19.54 |
| | 1898 | 81,702 | 100.00 “ | 606,981 | 19.09 |
| | 1899 | 89,106 | 100.00 “ | 771,672 | 19.22 |

The column headed "Number of tons sold" shows that during the last four years the sales of the various classes of fertilizers have increased (over the sales of 1895) as follows:

| | |
|---|---|
| Acid Phosphates | 62 per cent. |
| Acid Phosphates with Potash | 368 per cent. |
| Complete fertilizers | 67 per cent. |
| Ground bones | 50 per cent. |
| Acidulated bones | 32 per cent. |
| Total sales of all classes | 81 per cent. |

The remarkable increase in the case of acid phosphates with potash is worthy of special mention. It is even more clearly shown in the next column of the table, which gives the part represented by the various classes of fertilizers in the total sales for each year and from which it will be seen that in the case of acid phosphates with potash even the rate of increase is increasing; this largely at the expense of the plain acid phosphate. This is not due to any accident, or oversight, or to any special effort on the part of any one to promote the sale of this class of fertilizers, but rather to the experience of those who use them and doubtless has its explanation in the needs of certain crops on the soils of those sections to which the largest shipments are made. The station will look into this matter in connection with the work on soils.

The table shows that acid phosphates have constituted about one-half (by weight) of the total sales. In the five years they have lost to other classes to the extent of nearly six per cent. Still they are far in the lead and will probably continue so. They meet one crying need of the soils of this State, namely, available phosphoric acid, and there are other reasons for their popularity. Farmers have been using them for a long time and know just what to expect of them. They are the cheapest fertilizers on the market and are probably sold at smaller profit to the agents than any other class of fertilizer.

The sales of complete fertilizers have been somewhat irregular. For the five years they will average nearly one-third of the total sales, but they have lost nearly two and a-half per cent. since 1894.

Ground bones wiil average six per cent. of the total sales, but they have not reached this figure since 1896.

Acidulated bones represent the smallest part of the total sales with an average of about three per cent. For a number of reasons it would seem that this class of fertilizers ought to be more popular. They are, as a rule, most excellent goods. While they are not "complete" fertilizers they do contain in a most acceptable form the two consistuants of plant food (phosphoric acid and nitrogen) that are most likely to be deficient in the soils of this State. They are the genuine "dissolved bone phosphates," and it would seem that the prejudice against dissolving phosphate rock (to which manufacturers evidently mean to cater, when they call the latter dissolved "bone") should be in their favor. Conditions in this State would certainly entitle this class of fertilizers to a better showing than three per cent. of the total sales.

*Bulletin No. 64*, entitled "Sugar Beet Investigations in 1899," is a continuation of the investigations reported in 1898. It reports the results of the analysis of a number of hundreds of samples received from farmers in all sections of the State, and is worthy of the examination of all those who may be interested in the growing of this crop.

In order to indicate the results of these investigations in various parts of West Virginia, we here give Table 6, which gives the results from each county, with comments thereon.

## TABLE VI.

Giving the average Analysis of the beets from the Counties represented in the co-operative work.

| NAME OF COUNTY. | Number of Growers. | Number of Samples. | Average weight of Beets. Uncapped oz. | Average weight of Beets. Capped oz. | Sugar in juice per cent. | Purity of juice per cent. |
|---|---|---|---|---|---|---|
| Barbour | 4 | 8 | 24 | 20 | 12.21 | 76.8 |
| Boone | 2 | 3 | 11 | 8 | 8.35 | 66 2 |
| Braxton | 6 | 9 | 20 | 14 | 10.89 | 68.9 |
| Cabell | 3 | 5 | 18 | 15 | 12.69 | 71.2 |
| Calhoun | 1 | 1 | 30 | 25 | 11.91 | 77.8 |
| Clay | 2 | 2 | 16 | 11 | 10.69 | 73.2 |
| Doddridge | 4 | 7 | 27 | 21 | 12.11 | 71.6 |
| Fayette | 3 | 5 | 14 | 10 | 17 16 | 77.4 |
| Gilmer | 3 | 5 | 18 | 14 | 9 66 | 67.9 |
| Grant | 3 | 4 | 16 | 13 | 14 14 | 77.9 |
| Greenbrier | 14 | 17 | 19 | 16 | 15 29 | 77.3 |
| Hampshire | 5 | 13 | 16 | 13 | 14 08 | 77.7 |
| Hancock | 2 | 3 | 37 | 30 | 13.80 | 74.0 |
| Hardy | 8 | 20 | 18 | 15 | 12 67 | 74.5 |
| Harrison | 4 | 14 | 20 | 16 | 12.32 | 70 2 |
| Jackson | 6 | 12 | 21 | 17 | 12 34 | 74.7 |
| Jefferson | 2 | 4 | 29 | 20 | 12.81 | 75.2 |
| Lewis | 5 | 12 | 16 | 13 | 11.90 | 78 5 |
| McDowell | 1 | 1 | 10 | 7 | 10 88 | 66 3 |
| Marshall | 5 | 13 | 22 | 17 | 14.61 | 80 7 |
| Mason | 2 | 8 | 25 | 22 | 11.37 | 72.8 |
| Mercer | 3 | 9 | 17 | 15 | 14.91 | 78.0 |
| Mineral | 3 | 8 | 18 | 17 | 12.98 | 78.2 |
| Mingo | 3 | 7 | 9 | 8 | 10.42 | 69.0 |
| Monongahela | 3 | 87 | 15 | 13 | 14.42 | 82 7 |
| Morgan | 4 | 10 | 18 | 15 | 12 14 | 74.5 |
| Nicholas | 4 | 6 | 13 | 11 | 10.20 | 69.7 |
| Ohio | 1 | 2 | 19 | 16 | 13.83 | 75.9 |
| Pendleton | 6 | 11 | 18 | 14 | 9.90 | 68.3 |
| Pleasants | 15 | 12 | 27 | 20 | 9.90 | 68 6 |
| Pocahontas | 3 | 5 | 17 | 14 | 14.45 | 78.3 |
| Preston | 5 | 7 | 18 | 16 | 14.45 | 81.0 |
| Raleigh | 1 | 2 | 23 | 17 | 11 04 | 68 0 |
| Randolph | 6 | 7 | 11 | 9 | 12.95 | 82.4 |
| Ritchie | 1 | 2 | 18 | 13 | 11.70 | 72.9 |
| Taylor | 4 | 10 | 27 | 21 | 9.69 | 68.6 |
| Tucker | 2 | 7 | 14 | 13 | 13.74 | 76.8 |
| Upshur | 3 | 5 | 17 | 14 | 11.57 | 78.0 |
| Wayne | 2 | 2 | 28 | 22 | 8.36 | 72.0 |
| Webster | 4 | 8 | 9 | 7 | 9.30 | 67.7 |
| Wetzel | 2 | 5 | 24 | 18 | 12.37 | 72.0 |
| Wirt | 2 | 4 | 15 | 11 | 13.85 | 74 6 |
| Wood | 1 | 2 | 26 | 20 | 10.79 | 70.8 |
| Totals and averages | 153 | 386 | 18 0 | 14 9 | 12 77 | 76.15 |

The results recorded in the above tables leave little room to doubt that West Virginia soil and climate may be relied upon to produce a suitable sugar beet. It shows also that in the production of such beets in this State, the character of the soil, the cultivation and the fertilizer used, will probably be the principal factors.

We also insert a map from this bulletin, which shows the counties in which the co-operative work was done, and the sections in which the highest and lowest sugar content was found according to the analyses made at the station

*Bulletin No. 65*, entitled "Commercial Fertilizers" is an official report, to April, 1900, according to the requirements of the law on that subject.

*Bulletin No. 66*, entitled "Fruit Diseases and How to Treat Them". This bulletin aims to aid the practical grower by good pictures and simple descriptions to be able to identify the common fungus diseases liable to attack his apples, pears, peaches, plums or grapes. In addition to the description of the disease, the best known methods for holding those diseases in check are incorporated in the spray calendar, which is made a part of the bulletin.

To give an idea of the treatment which the diseases of the apple receive, that part relating to Apple Scab is here reproduced:

### APPLE SCAB.

**(Fusicladium Dendriticum.)**

This menace to modern apple culture is perhaps the most common and the most damaging fungous foe of the orchardist. It attacks both the fruit and foliage, but causes the greatest loss to the orchardists just at the blooming season. The young fruits attacked by the fungous at this period became blighted and fall from the tree. This trouble has been variously attributed to insufficient nourishment for the tree, imperfect pollination and too cold or wet during the blooming season. All these factors have more or less influence upon the setting of the fruit but the attack of the scab fungous is responsible for a greater loss at this period, under ordinary circumstances, than all the other factors combined. Not only does the scab cause heavy loss from dropping after blooming, but the fruits which escape at that period may be attacked later. Such fruits may remain upon the tree but their growth will be interfered with by the parasite to such an extent that at picking time the fruits will be small, irregular, rough, and blotched. In appearance the fruit may present only small irregular roughened brown spots, somewhat corky in nature, or the affected area may be large, covering one-third or one-half of the surface of the apple, in which case the skin becomes tough and woody and not unfrequently cracks open. In peeling the fruit the affected parts come off with the rind, unless the attack is severe when the flesh of the fruit, as well as the skin becomes corky. Fig. 3 illustrates fruits affected with the scab. This affection may be confounded with scars caused by the curculio but a little experience will teach the difference between the two markings. Upon the leaves the fungous appears as a sooty spot on the underside of the leaf; the upper surface showing a brownish discoloration. Upon close inspection the sooty areas look brown and velvety in early growth but assume a deeper shade later in the season. Affected leaves become yellow, and drop from the tree. If the attack is severe a considerable proportion of the foliage of the tree may be lost, thus interfering with its growth and also causing a premature ripening of the fruits. Fig. 4 represents a leaf as well as a fruit affected with the apple scab.

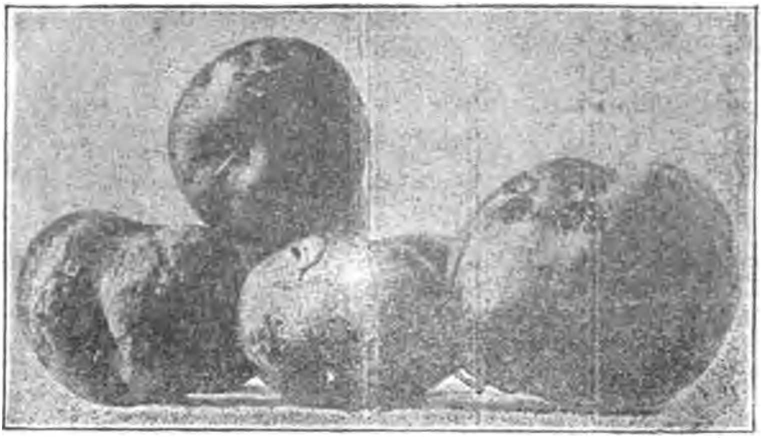
FIG. 8.—Scab on Fruit, after Lademan.

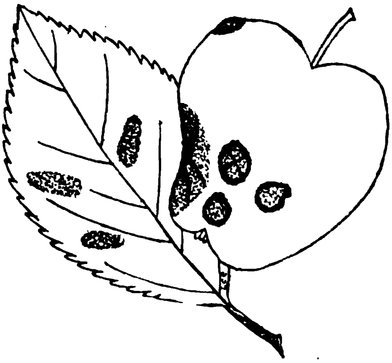
FIG. 4.—Apple Scab on leaf and fruit.

TREATMENT.—This disease is prevented by spraying the plants before the buds break in the spring with a solution of Copper Sulphate 1 lb. to 15 gallons of water. As soon as the blossom buds are well formed and again as soon as the blossoms fall, the trees should be treated with Bordeaux Mixture and Paris green or London purple; repeat this in two weeks and again in two or three weeks, depending upon the weather. If it is rainy. spray ing should be done more frequently than would be necessary during a dry period, as the rains wash the sprays off the fruits and foliage, leaving them exposed to the attack of the fungous which is more active during warm, moist weather than during a dry time.

# THE DEVELOPMENT OF AGRICULTURAL EDUCATION.

## AGRICULTURAL EDUCATION AT WEST VIRGINIA UNIVERSITY.

T. C. Atkeson, Ph. D., Dean of the West Virginia University College of Agriculture.

The subject of agricultural education is now attracting more attention throughout the country than ever before, and is beginning to assume the prominence to which the importance of the subject entitles it. A brief history of the rise and growth of agricultural education can hardly fail to be of great interest to the farmer readers of this Biennial Report.

It is with pleasure we acknowledge our indebtedness to Prof. J. D. Walters' "History of the Kansas State Agricultural College," from the opening chapter of which we have condensed a general account of the development and organization of the agricultural colleges:

*The Early Days.*—"During the colonial days agriculture and industrial art grew slowly, and did not reach a high state of development. For many generations the implements were of the coarsest kind, differing little from those used by the Indians. Life was a constant struggle for mere existence. Up to the middle of the eighteenth century, iron and shaping tools had to be imported from England, and Indian corn, milk, pork, beef, game and fish were the common food. There was little commerce and communication away from the coast. Agricultural education was not thought of, though even before the revolution there had been feeble attempts at agricultural journalism and agricultural meetings of a social character."

Wars are not favorable to the arts of tilling the soil. During the Revolution and the twenty years following, all energies were bent upon organizing a stronger defense, and better intercommunication. Congress coined money, adopted a system of weights and measures, developed the postal service, established a military and naval school, but it wholly overlooked the art of food production. In 1874 the commerce of the country was so insignificant that eight bales of cotton shipped from South Carolina were seized by the custom authorities of England on the ground that so large a quantity could not be produced in the United States. It was not until the beginning of the present century that farmers as a class commenced to recognize the importance of comparing methods of work, seeds, stock and other interests, and began to feel the need of more information for themselves and better schools for their children."

*Early Agricultural Societies.*—"Among the earliest contributors to agricultural education and interest must be mentioned the agricultural and horticultural societies. Many of these corporations have shed light for several generations and are still in existence. The first society for the promotion of agriculture was established in Philadelphia in 1785. Seven years later, on March 7th, the Massachusetts Society for Promoting Agriculture was incorporated. The New York Agricultural Society was organized the following year. An agricultural society was established in South Carolina at the same time. In 1803 the Western Society of Middlesex Husbandmen, formed in 1794, was incorporated with a provision that members of the Massachusetts Society should be honorary members. A voluntary agricultural association was established at Sturbridge in 1799; one at Kennebec in 1791, and one in Brookfield in 1807. Thus they multiplied all over the old States. The Horticultural Societies were but little behind. That of New York organized in 1818 was the first of its kind in the United States; then came that of Pennsylvania, organized in 1827; and that of Massachusetts two years later. The American Horticultural Society—first known as the American Congress of Fruit Growers and later as the American Pomological Society—was organized in 1884. The Kansas State Horticultural Society was incorporated December 15th, 1869, and that of Manhattan, January 24th, 1874. The National Agricultural Society was organized on December 10, 1879."

*The First Fairs and Stock Shows.*—"Another potent factor in the development of agriculture, was the fair or exposition. It is reported that the Agricultural Society of Massachusetts commenced the award of premiums for agricultural products in 1804. The first regular stock show in New England seems to have been held in 1807. In the autumn of that year Elkanah Watson, a native of Plymouth and a direct descendant of Governor Winslow (who in 1624 had brought the first neat cattle that came into New England), procured the first pair of Merino sheep which had been introduced into Berkshire. Colonel Humphrey of Connecticut, then late minister to Spain, had imported seventy-five ewes and twenty seven rams in 1802, and one Seth Adams had two Merino sheep imported from France. Mr. Watson gave notice of a public exhibition of his two sheep on the public square of Pittsfield. He wrote:

"Many farmers and even females were attracted to this novel and nimble exhibition. From this lucky incident I reasoned thus: If two animals are capable of exciting so much attention, what would be the effect of a display on a large scale of different animals? The farmers present responded to my remarks with approbation. We thus became acquainted and from that moment to the present have agricultural fairs and cattle shows, with all their connections, predominated in my mind."

On the first day of August, 1810, an appeal drawn by Mr. Watson and signed by twenty-six different persons, appointed an exhibition of stock on the first day of October. The effort was successful and resulted in a charter of the Berkshire Agricultural Society the ensuing winter of 1811. In the September following a formal and extended festival was held with a "procession of sixty-nine oxen drawing a plow held by the oldest man in the country, a band of music, the society bearing appropriate ensigns, each member decorated with a badge of two heads of wheat in his hat, and the officers three heads secured by a green ribbon." Mr. Watson, as president, delivered an address and awarded the premiums which amounted to a few dollars only.

*How They Developed.*—"It is interesting to read of these first attempts at organizing an institution, which in our day has developed into such stupendous undertakings as the Centennial Exposition, the Fat Stock Shows of Chicago and Kansas City, the World's Fair at Chicago, the Trans-Mississippi Exposition at Omaha, or the Kansas State Fair; the latter of which as early as 1883 had been able to boast of an attendance of nearly 100,000 people. It is to be regretted that the real purpose of these agricultural industrial fairs could not have kept in the fore-ground, but it must be admitted that they have been of incalculable benefit in the development of agricultural interests.

Much credit is due to the agricultural press. The pioneer agricultural journal, the American Farmer, issued its first number in 1819, and is still being published. The New England Farmer appeared in 1822, and the Kansas Farmer was established in 1863. To-day the number of periodicals devoted to agriculture and the kindred arts, as horticulture, floriculture, landscape gardening, cattle, horses, swine and sheep breeding, poultry and sheep-breeding, sugar, cotton, and tobacco planting, etc., must reach fully six hundred in America."

*The Growth of Agricultural Schools*—"Another motor has been the United States Department of Agriculture, established in 1837, as a branch of the United States Patent Office, afterwards as an independent sub-department, and lately as a cabinet office. But the greatest step in the development of agricultural art was the establishment of agricultural schools and experiment stations. In the patent office report for 1847 Mr. Charles L. Fleishman made the first elaborate report on agricultural schools which he had visited abroad. The writings of the great German chemist, Baron Von Liebig, on scientific agriculture, and rich contents of the proceedings of the Royal Agricultural Society of England, were being republished in our agricultural and scientific publications. Railroads and steamships commenced to do the work of transportation, and through these effective carriers farming was drawn into the galaxy of regular business enterprises, demanding not only hard labor, but management, foresight and knowledge.

A bill providing for the organization of an agricultural school and the establishment of an experimental station passed the Senate of Massachusetts as early as 1850, but it was defeated in the House. The defeat of this bill provoked much comment in agricultural circles and resulted in the appointment of a board of commissioners, who were to consider the matter and report at the next session. In 1851 their report, with an elaborate account of the organization and work of the agricultural schools of Europe, visited by Professor Hitchcock, was made to the Legislature. It commenced with the solid remark: "The first seed ever planted was the first effort of civilization." But the time was not favorable for the teaching of practical science. No immediate action resulted from their recommendations, except, perhaps, the establishment of a State Board of Agriculture; yet the matter was not permitted to rest. Massachusetts became a center of the agitation which finally triumphed in Congress in the passage of the "Morrill Act"; an act appropriating several millions of acres of wild land to the different States and Territories for the purpose of founding agricultural colleges. This act became a law in 1862.

*The Pioneer Agricultural College.*—"The honor of founding, organizing and maintaining the first working institution of learning on the continent, whose sole object should be the teaching of agriculture and agricultural science, belongs to the energetic State of Michigan. The constitution of Michigan, adopted in 1850, directed the legislature to encourage agricultural improvement and to provide for the establishment of an agricultural school. In obedience to this direction the legislature in 1855 authorized officers of the State Agricultural Society to select, subject to the approval of the State Board of Education, a site near Lansing for the school, and to purchase for it not less than five hundred nor more than a thousand acres of land. It appropriated twenty-two sections of salt-springs lands, or the money arising from their sale, for the purchase of land, erection of buildings and the payment of necessary expenses. A tract of land was selected about three miles from Lansing and the erection of buildings commenced. In May, 1857, the college went into operation, with a faculty of six teachers and an attendance of sixty-one students. During the first year of its existence the new school underwent severe trials. The buildings had been poorly constructed and required expensive repairs and additions. The price of building and furnishing materials was unexpectedly high. Efficient instruction could not be afforded. The curriculum was in an unsettled state; the old education was on the war-path and refused to give way to new ideas, and the question whether the new institution should continue to afford a general education or be so modified as to offer professional training alone, was vigorously debated. In 1859 the advocates of the latter idea were victorious. The course of instruction was cut down from four years to two, several of the professors resigned and discontent prevailed. The first agricultural college had not yet graduated one student when its young life was already in danger from irreconcilable differences of opinion as to how it should be run.

In 1861, a State Board of Agriculture was created, partly for the management of the State Agricultural College. The Board consisted of six appointed members, with the Governor of the State and the President of the College as members *ex-officio.* Half of them were to be practical farmers. Their term of service was to be six years, two going out of office every second spring. As a result of this organization, the course of study was again lengthened to four years; women were excluded from the course, and the afternoons of five days of each week were devoted to labor by the entire student body. The college provided a dormitory, with suitable board for all students, and neat cottages for all the professors.

These details concerning the early development of the pioneer agricultural college in America have been mentioned because the institution was the only existing State agricultural school when the "Morrill Act" was passed. Michigan became the pattern for nearly every one of her sister States and her professors and graduates were eagerly sought by other countries to inaugurate and put in motion the many institutions which were organized during the sixties. The school of Michigan is still doing good work, though it has lost much of its former prestige. Political intrigues have at several times greatly interfered with its usefulness and growth."

*Other Colleges.*—"The year 1870 found agricultural colleges in nearly every State in the Union, although some of the Southern States, owing to their adherence to the now exploded notion of State rights, were very slow in accepting the magnificent Federal land grant. The fifty or more agricultural colleges founded under this act, have not all been highly successful. Some organized high-grade university courses in pure science, tinted with applied work, made it impossible for the young man or the young woman from the rural school to enter. They aimed at educating scientists and teachers rather than farmers. Other agricultural colleges were connected with universities, and became literary kites with agricultural tails. Others fooled away their heritage to speculators and land-grabbers, receiving but little of the proceeds, and remained too poor to do their work. Many of the colleges, however, did fully as well as the most sanguine advocates of the passage of the "Morrill Act" could have hoped. The total attendance of the State agricultural colleges in America in 1898, was 331,090; the number of teachers, 1,720."

*Agricultural Science.*—"The agricultural colleges contributed to the growth of scientific agriculture, not only through the education of thousands of farmers' sons and farmers' daughters, but they developed agricultural science itself. Their laboratories and experimental farms became gradually the recognized fountains of agricultural knowledge. Much valuable work was done in many lines of experiments in New York, Michigan, Wisconsin, California and other States before 1887, though in most States funds for such purposes were persistently refused by the Legislatures. The passage by Congress in that year of the so-called "Hatch bill" provided for the organization in each State agricultural college of a station for agricultural experiments, by appropriating annual contributions of $15,000. This gift, amounting in the aggregate to three-quarters of a million dollars per year, distributed equally over the broad area of country, gave an impetus to agricultural science which was bound to result not only in valuable investigations and practical results, but in giving the heterogeneous elements of the college faculties a distinctly scientific color—it settled the old disputes between the humanistic and realistic factions. The past decade has proven the great value of these stations, and it may confidently be asserted that the harvest will be greater in the future. It is probably true that the large number of experimenters who were called into service by the passage of the "Hatch bill" had very "diversified" conceptions of the purpose, scope and value of agricultural experiments, that there were many useful repetitions of such work and much scientific tinkering and show-making; but on the whole the experiment stations have fulfilled the high expectations of their founder. The station reports furnish the most valuable topics for the agricultural press, and the station bulletins are being distributed broadcast over the farming districts of all States and Territories.

*The Farmers' Institute.*—"Another factor which, during the last twenty years, has contributed much to elevate the standard of actual farming and to beget enthusiasm for rural pursuits, is the Farmers' Institute. In some of the Western States the Institute was inaugurated by the Agricultural College, and though it is not originally a creation of this, it has become a valuable means of direct intercourse of the farmer and professor. Farmers' Institutes were held in several States in the East twenty years before the advent of agricultural colleges. This work has done much for the development of a better system of farming, yet it must not be overlooked that the farmer who has received but little scientific training cannot be benefitted to a great extent by ready-made, scientific facts. 'The youths from the farm must first find in the schools of agriculture some stimulant to scientific thoughtfulness. The results of research and experiment can be accepted and utilized by those only whose training has somehow fitted them for such appreciation and adaptation to present wants. In agriculture especially, the judgment needed to adopt and adapt to varying conditions any improvement depends upon previous familiarity with a multitude of relations. For the problems of agriculture are infinitely varied."

*The Growth of Years.*—"To the items mentioned in the preceding paragraph should be added many of the instrumentalities of progress; the rapid development of better means of communication and transportation; the enormous increase of home and foreign consumption; the growth of the manufacturing industries; the invention of the processes of curing and preserving; the perfection of every implement and tool; the importation and propagation of stock, cereals, vegetables and fruit, and last, but not least, the growth of the common school and the phenomenal revelations of modern science. Sixty years ago there was but little known of the many phenomena of life. The great thought that all species were but twigs of the same tree, had not been formulated, as yet, and there was no conception of the possibilities of seed-breeding and stock breeding. Nothing was known of bacteriology and the real nature of the contagious diseases. Fermentation and decay were ascribed to chemical affinities. No one dreamed of the great law of indestructibility of force and of the perfect application of all physical laws to organic life. To-day the rays of scientific discovery are penetrating everything and total ignorance is rare among the growing generation of farmers.

"The morning light is breaking,
The darkness disappears."

*Land-Grant Colleges.*—The National Department of Agriculture publishes the following statistics of the "land-grant" colleges for the year 1899, which must be of interest in this connection: "Educational institutions receiving the benefits of the Acts of Congress of July 1st, 1862, and August 30th, 1890, are now in operation in all the states and territories except Alaska. The total number of these institutions is 64, of which 61 maintain courses of instruction in agriculture. The aggregate value of the permanent funds and equipment of the land-grant colleges and universities in 1899, is estimated to be as follows:

| | |
|---|---|
| Land-grant fund of 1862 | $10,262.944.00 |
| Other land-grant funds | 1,441,577.38 |
| Other permanent funds | 14,442,194.25 |

| | |
|---|---|
| Land-grant of 1862 still unsold | 4,062,850.30 |
| Farms and grounds owned by the institutions | 5,543,108.91 |
| Buildings | 16,009,274.53 |
| Apparatus | 1,955,859.21 |
| Machinery | 1,373,696.75 |
| Libraries | 1,854,942.21 |
| Miscellaneous equipment | 1,997,690.07 |
| Total | $58,944,137.61 |

The income of these institutions in 1899, exclusive of the funds received from the United States for agricultural stations, ($666,000) was as follows:

| | |
|---|---|
| Interest on land-grant of 1862 | $ 624,672.88 |
| Interest on other funds | 651,864.85 |
| U. S. appropriation under Act of 1899 | 1,120,778.96 |
| State appropriation, annual or regular | 1,679,536.99 |
| State appropriation (occasional) | 608,380.99 |
| Tuition fees | 580,946.45 |
| Incidental fees | 177,343.91 |
| Miscellaneous | 550,512.58 |
| Total | $5,994,037.61 |

The value of the additions to the permanent endowment and equipment of these institutions in 1899, is estimated as follows:

| | |
|---|---|
| Permanent endowment | $1,411,325.29 |
| Buildings | 452,033.19 |
| Library | 117,693.99 |
| Apparatus | 120,901.23 |
| Machinery | 115,336.20 |
| Miscellaneous | 147,862.53 |
| Total | $2,365,152.43 |

The number of persons in the faculties of the colleges of agriculture and mechanic arts were as follows:

| | |
|---|---|
| For preparatory classes | 315 |
| For collegiate and special | 1,669 |
| Total | 1,878 |

In the other departments the faculties aggregated 1,015, mak- a grand total of 2,893 persons in the faculties of the land-grant institutions. The students in 1899 were as follows:

(1) By classes—

| | |
|---|---|
| Preparatory | 6,658 |
| Freshmen | 7,093 |
| Sophomores | 4,500 |
| Juniors | 3,715 |
| Seniors | 2,846 |
| Special | 10,399 |
| Post Graduate | 745 |
| Total | 35,959 |

(2) By courses—

| | |
|---|---|
| Agriculture | 4,407 |
| Mechanical engineering | 1,325 |
| Civil engineering | 1,463 |
| Electrical engineering | 1,325 |
| Mining engineering | 713 |
| Architecture | 410 |
| Household economy | 1,573 |
| Veterinary science | 646 |
| Military tactics | 10,416 |

The graduates in 1899 were 2,232, and since the organization of these institutions, 39,084. The average of graduates of 1899 was 22 years, 2 months. The total number of volumes in the libraries was 1,463,845. The total number of acres of land granted to the States under the act of 1862 was 9,359,241, of which 985,833 are still unsold."

*West Virginia University.*—The "*land-grant College of West Virginia.*" "In 1814 the Legislature of Virginia passed an act incorporating the Monongalia Academy and locating it at Morgantown. The first building was a one-story brick structure, divided into two rooms. In 1828 this building was sold and a two-story brick building erected. As a further endowment the Virginia Legislature passed an act authorizing the trustees of the Academy to raise $20,000 by a lottery, and the drawings of this lottery were conducted January 26th, 1832. In later years the Monongalia Academy became an institution of wide reputation, drawing students at one time from fourteen States. For more than fifty years it was the leading school in Virginia west of the mountains. On July 2nd, 1862, Congress passed an act donating public lands to the several States to 'establish colleges for the benefit of Agriculture and the Mechanic Arts'. In 1864 this act was extended to the new State of West Virginia, and in1867 the West Virginia Agricultural College was founded. The trustees of the Monongalia Academy gave to the State all thereal estate and personal effects of the Academy. The building and grounds of Woodburn Seminary, a school for girls in Morgantown, were also donated, and the new college succeeded the old academy and seminary, inheriting an honorable record and much good-will. The first faculty meeting was held August 20, 1867, and on September 2nd of that year the school was formerly opened. In 1868 the name of the new institution was changed by act of the Legislature to the 'West Virginia University'."

*Agriculture at the University.*—The people who took control of the West Virginia Agricultural College, and later the Univerversity, seem to have had but little appreciation of agriculture or agricultural science, or respect for same, as a part of college training; and in the early days of the institution agriculture seems to have been regarded with little favor. Hence the change of name. The manifest purpose of establishing the "land-grant" colleges was to provide industrial education and primarily for no other purpose, some other things not being excluded. We have taken the trouble to go over all the catalogues of the University since its establishment in 1867, in an effort to ascertain the facts as to the recognition of agriculture in that institution.

*Facts in Detail.*—In 1867, course in agriculture, only textbook, Emerson and Flint's Manual of Agriculture, lectures by Professor of Natural Sciences, Labor corps 1868, same as year before. Name changed to West Virginia University, 1869. Agriculture practically eliminated from the institution. The industrial feature entirely ignored. 1870, condition unchanged. 1871, Professor of Astronomy and Physics a man who did not know the first elements of agriculture.

Announced a course in Agriculture as follows: "Agriculture, embracing the various branches of agriculture, horticulture, rural economy, and the mechanic arts." He probably planted his crops in the moon and received his knowledge of mechanic arts from Vulcan. 1872, lectures in agriculture by Professor of Chemistry and Natural Philosophy—the first time the subject had been recognized in the title of a Professor. The course of study was a curiosity and covered two years, and on completion a certificate was granted. In June, 1873, President Martin in his report to the Board of Regents, said:

"Permit me, gentlemen, to urge all possibility toward the school of Agricultural, Chemical and Natural History. * * * * * Let there be no longer any hesitancy or reserve in taking steps for pushing more fully to the front the great interest of education as related to agriculture, and the mechanic arts, as so prominently contemplated in the law of Congress."

Nothing was done in answer to this appeal and confession of President Martin, that the law of Congress had not been complied with. In 1875 the statement was made that "several of our young men have hereunto found it pleasant and helpful to spend an hour or two per day at a remunerative price in improving and renovating the grounds, under the direction of the Superintendent."

A farce. We tried it once. Up to 1876 there is no evidence that there were any students in agriculture. In the Catalogue of this year Mr. Virgil Vandevort is given as a student in agriculture. In the catalogues for 1877, we find this announcement: "Young men who desire to study only such branches as will enable the farmer to pursue his calling with intelligence and profit, will here find at small expense of time or money, all they need in the way of sound, practical education."

The one student of the year before must have give some one a spasm. The imagination collapsed under the strain. 1878, no students, and agriculture almost entirely eliminated from the institution. 1879 same as previous year. 1880, agricultural course, with agriculture left out. No Professor of Agriculture, Chemistry and Natural Science. 1881, name only retained. 1882, Professor of Agriculture, Chemistry and Physics, elected. Agriculture left out. In 1883 the following announcement was made:

"The Class in Agriculture meets twice a week during the latter half of the session. The University lacks the means for instruction in practical agriculture, and all that is attempted with students of this class is to acquaint them with some of the principles underlying successful farm practice. In 1884, the so-called 'School System' adopted at the University, Agricultural Course, abandoned. 1885 to 1891 there seems to have been no effort or pretense of complying with 'the law of Congress'. The only text-book on Agriculture used in all the years from 1867 to 1891 was 'Emerson and Flint's Manual of Agriculture'."

*The Morrill Law.*—On August 30, 1890, the National Congress passed the bill introduced by Senator Justin S. Morrill, which has since been known as the "Morrill Law", providing for the further endowment of the "land-grant" colleges. It carried an appropriation of $15,000 the first year, with an increase of $1,000 each year until it reached the maximum amount of $25,000 for each State and Territory, and states that when the whites and negroes were not co-educated the negroes were to be provided for separately and receive a share of the fund in proportion to population. In this State the fund has been divided between the University at Morgantown and the Colored Institute at Farm, Kanawha county; the University now receiving $2,000 and the Institute $5,000 per year. The "Morrill Act" provided that the appropriation was: "To be applied only to instruction in agriculture, the mechanic arts, the English language and the various branches of mathematical, physical, natural and economic science, with special reference to their applications in the industries of life, and to the faculties for such instruction." The purpose of the law was evidently to still further impress upon the "land-grant" colleges their industrial features. The Board of Regents of the University recognized this fact and proceeded to comply with the law.

*A Step Forward.*—At a meeting of the Board of Regents, in June, 1891, the Chair of Agriculture was created and Prof. T. C. Atkeson was appointed Professor of Agriculture. At the opening of the fall term in September, 1891, the Department of Agriculture was established and a full three years' course in agriculture announced. The first year twelve students were enrolled in the course, and the second year fifteen students were enrolled and pursued their studies with zeal and enthusiasm. At the end of the second year Prof. Atkeson retired and Mr. F. W. Rane, Horticulturist of the Experiment Station, was made Professor of Agriculture and Horticulture. The course was rearranged and somewhat expanded, covering a period of five years instead of three. At the end of two years, Prof. L. C. Corbett succeeded Prof. Rane. For some reason, the attendance fell off from year to year until June, 1897, when the enrollment had practically disappeared entirely.

*The College of Agriculture.*—At the meeting of the Board of Regents, in June, 1897, the present College of Agriculture was established. T. C. Atkeson was elected Dean of the College and Professor of Agriculture, and the course of study was at once re-arranged, beginning with the fall term of 1897. A few changes have since been made. We make the following abridgment from the University Catalogue of 1900:

*The Faculty.*—Jerome Hall Raymond, Ph. D., President of the University and Professor of Economics and Sociology.

Thomas Clark Atkeson, Ph. D., Dean and Professor of Agriculture.

Lee Cleveland Corbett, M. S., Professor of Horticulture and Forestry.

Andrew Delmar Hopkins, Ph. D., Professor of Economic Entomology.

Bert Holmes Hite, M. S., Professor of Agricultural Chemistry.

Frederick Philip Ruhl, D. V. S., Professor of Veterinary Science.

William Earl Rumsey, B. S. Agr., Fellow in Agriculture.

*Equipment.*—The well-equipped scientific departments of the University together with their laboratories and scientific apparatus, and the libraries of the Agricultural Experiment Station and University are at the command of the students in the College of Agriculture. The farm of the Agricultural Experiment Station, together with its gardens, experimental platns, laboratories and collections will be available for students desiring to acquaint themselves with the practical and scientific methods of conducting agricultural pursuits and to investigate scientific questions relating to the progress and development of agriculture. The farm is equipped with barns, stables and other buildings, and presents a variety of soils and conditions existing upon many of the farms of the State. Upon this farm are kept different variety of farm animals and the most approved agricultural implements; and facilities are provided for studying the most economic methods of handling live stock and their products, including poultry. The students, who complete the course in this college, are expected to be thoroughly up-to-date and enthusiastic followers of their chosen profession, as well as broadly educated citizens.

*Courses of Study.*—1. The regular four years course, leading to the degree of Bachelor of Science in Agriculture (B. S. Agr.).

2. The two years course leading to the degree of Bachelor of Agriculture (B. Agr.).

3. The one year course, which does not lead to any degree, but for the completion of which a certificate is given.

4. A special twelve weeks course so arranged that students may complete the one year course in three winter quarters.

5. A special twelve weeks course in veterinary science, stock breeding and feeding will be given during the winter quarter.

6. The Agricultural Home Reading Course, for those who can not attend the University in person, but desire University guidance in carrying on a course of agricultural study at home.

*Bachelor of Science in Agriculture.*—The degree of Bachelor of Science in Agriculture will be conferred upon any student who satisfies all entrance requirements and satisfactorily completes forty-two college courses, of which at least ten courses, including a thesis, are in the College of Agriculture. The Dean of the College of Agriculture will act as the student's class officer and adviser, and will have authority to require the completion of the major subject and such minor subjects as he may consider necessary or advisable collateral work; but such minor requirements will not exceed six courses. With the exception of these major and minor courses, all work is elective and the student may, in consultation with his major professor, freely choose any subject taught in the University, which his previous studies have prepared him to undertake; but the recommendation of his major professor is necessary to graduation; and no degree will be conferred upon any student who has not received credit for at least forty two full college courses, and spent at least one University year (three quarters) in resident study at this University.

*Bachelor of Agriculture.*—This degree will be conferred upon any student who satisfies the entrance requirements and satisfactorily completes twenty-four college courses, of which at least ten courses (including a thesis) are in the College of Agriture. Other requirements are the same as for the degree of Bachelor of Science in Agriculture.

*The One Year Course.*—This course consists of twelve courses selected from those included in the College of Agriculture. No entrance requirements are made for this course. A certificate indicating the work done will be granted on the completion of this course. It is confidently believed that many young men who are farmers—or expect to become farmers—will find it greatly to their advantage to devote one year to this course if, for any reason, they cannot give the time necessary to complete a longer course.

*One Quarter Courses.*—Two special twelve weeks courses are offered during the winter quarter. Course One is so arranged that the one-year course in agriculture may be completed in three winter quarters. Its object is to provide a winter course for young farmers who may be able to spend only the winter at the university. Course Two is a winter course in veterinary science, stock breeding, stock feeding, and a general study of animal industry. The purpose is not to make veterinary surgeons, but to enable students to properly diagnose the principal diseases among farm animals, to treat common accidents, and to use preventive measures. No entrance requirements are made for these courses.

*Agricultural Home-Reading Course.*—Since it is impossible for a great majority of the farmers of the State to attend the College of Agriculture, the faculty has determined to do all it can to take the college to the farmer by offering a syztematic course of Home Reading in Agriculture. It is not expected that this course will, in any sense, take the place of a regular place but it is expected that every one who faithfully pursues this carefully-prepared course, upon technical agriculture, horticulture, stock-growing, rural economy and kindred subjects, will be vastly benefited thereby.

This course is open to all, there being no requirements as to age, sex or previous preparation, and no examination is required for admission. No fee is charged for registering students in this course.

The course may be begun at any time, and carried on as rapidly or as slowly as may be required or desirable. The subjects may be taken up in any order desired and any part of the course taken without the rest. The whole course is divided into four divisions, but a regular course may consist of any two of the four divisions, or the student may elect any ten of the twenty subjects given.

*Number of Students.*—For the year 1897–1898 there were enrolled in the College of Agriculture 10 students; 21 in 1898–1899, and 33 in 1899–1900.

*Graduates of the College of Agriculture.*—Clarence Edwin Mayers, B. Agr. 1893, Electrician, Fairmont, West Virginia.

James Madison Johnson, B. Agr., 1894, (M. S. Cornell) Assistant Agriculturist, North Carolina Agricultural Experiment Station.

Thomas Carskadon Johnson, B. S. Agr., 1896; A. M., 1900. Fellow in Mathematics, West Virginia University.

William Frazier Naret, B. Agr., 1898; B. S. Agr., 1899; A. M., 1900. Fellow in Agriculture, 1899-1900. With Allegheny Orchard Company.

Thomas Zephaniah Atkeson, B. Agr., 1899; B. S. Agr., 1900. Fellow in Agriculture at West Virginia University.

Clarence Symns, B. Agr., 1900. Farmer and Stockman, Monroe County, West Virginia.

Two or three young men will graduate next year and a number of others are well up in their college course. Several have completed the one year course and others have been "special" and "one-quarter" students, who are now putting in practice on West Virginia farms what they learned at the University. Hundreds of farmers who could not attend the University have been students of the Agricultural Home Reading Course, and have derived great benefit from their systematic reading, during leisure time on the farm.

## CONCLUSION.

It has come to be a well recognized fact that the successful farmer of the future must have more or less special training for his business. Recognizing this fact in all its importance, the University College of Agriculture is doing all it can to meet the demands for higher education. The equipment and faculties will be increased just as rapidly as there may be a demand for same. We wish to say to the farmers boys who read this report: 'It is all right for you to educate your bright boys for the other professions and occupations in life, but *do not* discriminate against the boys who are to be your successors on the farm. Give the farmer boy a chance.

# THE TOPOGRAPHY
# OF
# WEST VIRGINIA,
# ITS NATURAL RESOURCES, MINERALS, ORIGIN AND DISTRIBUTION OF ITS SOILS.

# THE TOPOGRAPHY OF WEST VIRGINIA.

*By Prof. Samuel B. Brown, Professor of Geology in the West Virginia University and member of the National Geographic Society.*

The Topography of West Virginia is complex; its features varied, and its scenery of unrivaled beauty. It has broad valleys on its eastern and western sides, which narrow into steep ravines and canons as we approach the upland region. Between these deep stream channels stand its sculptured hills which east of the central part of the State rise into true mountains composed of folded layers arranged in parrallel ridges and separated from each other by both longitudinal and transverse valleys. The surface of the State slopes in three directions, to the east, to the north and to the south-west.

The topography of West Virginia has a vertical range of 4,600 feet, being lowest, 260 feet above the sea at Harper's Ferry, and highest, 4,860 feet above the sea at the top of Spruce Knob, in Pendleton county.

The average elevation of West Virginia is greater than that of any other State east of the Mississippi river. The average elevation of the highest Appalachian States above the sea level is as follows:

New Hampshire, 1,000 feet.
Vermont, 1,000 feet.
New York, 900 feet.
Pennsylvania, 1,100 feet.
Ohio, 850 feet.
Virginia, 850 feet.
West Virginia, 1,500 feet.

From the top of Spruce Mountain the tributaries of the Potomac descend rapidly to the eastward and pass from the State at Harper's Ferry; the waters of the Cheat flow to the northward and within sight of the Pennsylvania line empty into the Monongahela; the Greenbrier and Elk flow to the southwest and entering the Great Kanawha soon join the Ohio which leaves the State at the mouth of the Big Sandy. So the lowest points of the three inclined planes are at the mouth of the Shenadoah 260 feet above thc sea, the mouth of the Big Sandy 500 feet above the sea, and the mouth of the Cheat river 775 feet above the sea.

Within these three points the successive contour lines become smaller and smaller, until when the 3000 foot level is reached this contour line is no longer continuous, but is broken into a number of separate circles and elipses surrounding the higher knobs and ridges.

As 60 per cent. of the grain of the United States is raised below the 1000 foot level, and 90 per cent. of the grain of the United States is raised below the 1,500 foot level, it becomes a matter of very great interest to know where these lines run in our State, and to know what counties are above and below them. The 1000 foot level is far above the general surface of the more southwestern counties and Ohio River counties and extends up the river valleys into the central counties. In Jefferson and and Berkeley counties it is almost even with the summits of the Blue Ridge and North Mountains, so that the general surface of these counties as well as that of Morgan and Hampshire is much below this level. This contour line creeps up the Big Sandy to the mouth of Crane Creek on Dry Fork, and to the mouth of Dry Branch on Tug Fork, in McDowell county. It extends up the Great Kanawha to Sewell in Fayette county, up the Gauley to Wood's Ferry, and up Elk River to the Braxton-Webster county line.

On the Little Kanawha the 1,000 foot contour line extends up the river to the mouth of Glady Creek in the southern part of Lewis county, thence it skirts across the country with many irregular windings to near the corner of the Pennsylvania line. It extends northward through the counties of Green and Washington and turning eastward and southward again crosses these counties and enters West Virginia in Monongalia county, 225 feet above the river level. It creeps up the narrow canon of the Cheat River to the mouth of Sandy in Preston county, and up the Tygart's Valley River to six miles above Grafton, and up the West Fork River to Weston. The 1,000 foot level extends up the North Branch of the Potomac above Piedmont to Bloomington and up the South Branch of the Potomac to the Forks of the river above Petersburg in Grant county.

The 1,500 foot contour line extends up the Big Sandy River to the mouth of Cucumber Creek in McDowell county, up the Greenbrier River to Lowell Station, and up the New River beyond the Virginia line to the mouth of East River.

It extends up the Gauley to Hughe's Ferry, up the Elk to Addison, and up the Little Kanawha to the mouth of the Right Fork of Right Fork in Upshur-Webster line.

This level extends up the Buckhannon River to the mouth of Grassy Run, in Upshur County, up the Cheat River to St. George, in Tucker County. In the eastern counties this level extends up the north branch of the Potomac to the river bed directly below Elk Garden, and up the south branch of the Potomac to the mouth of Deer Run, in Pendleton County.

Although the highest mountain in the State is in Pendleton County, the county of highest general elevation is Pocahontas. This county can hardly have an average elevation of less than 3,000 feet above the sea.

The Greenbrier River enters Pocahontas County on either side of Beech Mountain at an elevation of 3,300 feet above the sea, and leaves the county at its southern extremity at 2,000 feet above the sea. Cranberry River and Williams River are each 3,000 feet above the sea at the Pocahontas-Webster line, and Elk River passes the Pocahontas-Randolph line at a height of 2,500 feet.

Shaver's Fork of Cheat enters Randolph from Pocahontas at a height of 3,700 feet above the sea, so that the high uplands of the State are distributed among the counties of Pendleton, Pocahontas and Randolph. The following are a few of the highest elevations of that region, although many more above 4,000 feet in height might be named:

| | | | |
|---|---|---|---|
| Spruce Knob | Pendleton Co | 4,860 | feet. |
| Panther Knob | " | 4,500 | " |
| Bald Knob | Pocahontas Co | 4,800 | " |
| Spruce Knob | " | 4,730 | " |
| Mace Knob | " | 4,700 | " |
| Bear Mountain | " | 4,600 | " |
| Elleber Ridge | " | 4,600 | " |
| Watering Pond Knob | " | 4,600 | " |
| High Knob | Randolph Co | 4,710 | " |
| Green Knob | " | 4,485 | " |
| Briar Patch Mountain | " | 4,480 | " |
| Barton Knob | " | 4,600 | " |
| Yokum's Knob | " | 4,330 | " |
| Hutton's Knob | " | 4,260 | " |
| Bayard's Knob | " | 4,150 | " |

The foregoing facts show that a very large area of our State lies at the comparatively high level of more than 2,000 feet above the sea. Above this level farming operations become very limited, and whatever may have been the case while the soil was new, the business of this region will ultimately become reduced to three principal pursuits—forestry, grazing and mining.

Apples, however, thrive admirably in all these upland counties, and more attention should be given to their culture.

The largest production of the various cereal crops in West Virginia is clearly explained by the topography of our State. Thus the counties producing the largest amounts of corn are in order as follows: Wayne, Jefferson, Berkeley, Mason. The elevation of these four counties is the lowest of any four counties in the State.

The counties producing the largest amounts of wheat are Jefferson, Berkeley, Marshall and Mason. This is evidently due to the low elevation of the counties, and consequently their high temperature.

The principal production of rye is distributed as follows: Hampshire, Morgan, Hardy and Pendleton.

Almost all of the buckwheat in the State is raised in Preston, Hampshire, Pendleton, Pocahontas and Tucker.

Thus does nature determine what crops man shall sow in each topographic district and in each upland zone.

## RESOURCES OF WEST VIRGINIA.

The first of these is altitude. This ranges from 260 feet above the sea to 4,860 feet above the sea, giving us a vertical range of 4,600 feet. That is nearly a mile of vertical measurement. The State of Ohio has only a vertical range of about 1,100 feet, and the State of Indiana a vertical range of about 500 feet. But of what importance is the vertical range of a district in considering its natural resources? Our range of latitude is 3½ degrees, or from 37 degrees 10 minutes to 40 degrees 40 minutes. Now range of latitude gives variety to the natural products of a region; likewise great range of altitude gives variety to the natural products.

Our range of altitude of 4,600 feet gives West Virginia a range of latitude of not less than 12 to 15 degrees. That means that the vegetable and forest products of West Virginia are such as may be found from the southern line of Virginia to beyond the Canadian border.

This, which might have been predicted, has, in fact, turned out to be true, from an actual examination of the forest products from the river valleys to the mountain tops. We have, according to the new classification of life zones, three of these very well defined in our State: the Upper Austral or Carolinian, the Transition and the Canadian.

The Carolinian zone is the region in which the sassafras, the tulip tree, hackberry, sweet gum, persimmon and paw paw are typical trees, while the grey fox, the fox squirrel, the opossum, the cardinal red bird, the Carolina wren, the tufted titmouse, the gnat-catcher and the yellow-breasted chat are type animals. In this zone the Ben Davis and wine-sap apples, the peach, the apricot, quince, sweet potato, tobacco and the hardier grapes thrive the best. This zone covers the western half of West Virginia, and most of the eastern pan handle.

The Transition zone is the zone that has the climate and products of New England. The counties of Preston, Barbour, Upshur and Webster form a belt in our State that belongs to this zone. The products are represented by the Baldwin, Greening and Wealthy apples, blue plums, cherries, white potatoes, barley, oats and buckwheat.

The Canadian zone extends southward through the eastern and mountainous parts of our State, and most of our mountains and plateaus above the level of 3,000 feet may be counted as belonging to it. That allows pretty large areas in the counties of Tucker, Randolph, Pendleton and Pocahontas having a vertical elevation of 1,500 to 1,800 feet above the 3,000 foot level to be classed in the Canadian zone. Its forests are cone-bearing trees, the hemlock and birches. Its characteristic animals are the white rabbit, the red squirrel, the white-throated sparrow, and the yellow-rumped warbler. White potatoes, turnips, beets and the Oldberg apple are the most profitable crops. In this Canadian zone labor spent in attempting to raise corn or wheat is not only wasted, but this labor hastens the destruction of the soil, which should be protected in those upland regions by every means possible.

The work of the farm should be almost entirely confined to grazing and to raising the hardier garden products. There is an industry that might be pursued with considerable profit in the counties of Preston, Randolph, Webster and Pocahontas, and that is the raising of cranberries. The upland swamps and glades of these counties from being mere worthless wastes, might, by a study of the conditions of cranberry culture and celery culture, be turned in- to the most profitable districts of these regions.

But a vertical fall of over 4000 feet in our streams gives us a water power perhaps greater than that of any of the States of the Mississippi valley, except that of Kentucky. This water is waiting to be untilized in turning mills and factories, in generating electricity, and in supplying our towns with the purest of mountain water. But this great slope of 4,600 feet will do many other things for us that other people have to pay for having done for them. This slope drains our mines both of water and gas by gravity and carries the loaded cars to the dump and thence to the boats. What advantage does that give us? Just this. Since 1890 the coal production of Ohio which is raised against gravity, has declined, while in our State, where gravity helps to mine and transport the coal, the production has increased one-half, and West Virginia is now producing more coal than Ohio. And the effect of this mighty helper is shown in the cost of mining coal, which is less in West Virginia than in any other part of the world. While the foreigner must delve thousands of feet below the drainage level and lift the coal to the surface by the most powerful machinery and contend with a flood of water and gas, our mines free themselves both of water and gasses, and gravity carries the loaded product to market. Great is gravity, and neither the Briton, nor Belgian, nor German nor Nova Scotian can compete with it. In quality our steaming coal has no superiors and few equals; as soon as it touched the sea-board the greyhounds of the ocean sped forward with a quicker movement, and when it entered Chicago it made captive the greatest establishments of that young capital of commerce, even against the great coal production of Illinois.

But we have oil and gas also, and almost any district between the Ohio and Monongahela and Ohio and Elk rivers seems to be promising territory for the development of these valuable fuels.

"The deposits of petroleum seem to be in the main limited to a field occupying a portion of western Pennsylvania, western half of West Virginia, and eastern Ohio, and another and smaller and less important district on the waters of the Cumberland river, near the point where it crosses the division line between Kentucky and Tennessee. Although the quantity of petroleum accessible at any one point in this valley appears to be rather less than that which can be obtained in the famous Caspian or Baiku field, the district is, probably, all things considered, the most extensive source of supply of this substance which the world is likely to afford. The natural gas of the Ohio valley appears to be far more considerable in quantity than that contained within any other equal area.

"Thus in this district we have three known sources of valuable subterranean energy, coal, petroleum and natural gas in more advantageous conditions, as regards quantity and nearness to fertile agricultural areas than any other region in the world."

"The group of States of the Ohio Valley, and to which we belong, has from the point of view of its resources singular advantages over any other part of the continent for the maintenance of a vast population engaged in industries, both those of the soil and those of the shop. Within a century the area occupied by these States is likely to contain a larger population than that which now exists in all English speaking countries.

"Although this population is destined to be to a great extent engaged in mining and manufacturing, there is room in this region for an agricultural people exceeding in numbers the present population of the United States; for there is hardly any untillable land in its area, and except for the limitations which the necessary preservation of the forests put upon the extension of the tilled fields, 99 hundredths of its area can be won to husbandry."—Shaler.

With these vast populations then living in the Ohio Valley what will be the value of our mountains? Let us see. If a traveler seventy-five years ago had asked a New Hampshire man what he accounted an important natural resource in his State, would he have answered Mount Washington that is covered seven or eight months of the year with snow? No, he would have looked with blank astonishment at the man who would have suggested it. But with the development of New England into manufacturing region and with the coming of the railroad all this has changed. The White Mountains have become one vast summer sanitarium for the crowded city population of New England.

From the most ancient times warm springs and mineral springs have been the favorite resorts of the rich as well as the afflicted.

Since the coming of quick and cheap transportation the mountains, that formerly yielded but a precarious existence for a few months of the year to flocks and herds, are now also coming to be the resorts of the rich and afflicted. The utilization of the health-giving air of the mountains is a movement that belongs principally to our own century and is one of the results of easy and quick transportation.

The mountains that are the glory of our State; centers of scenic beauty and grandeur, are then coming to have more and more an economic, as well as an æsthetic, value. The mountains are doing more every year towards regulating the health and prolonging the lives of vast populations. And in this great movement the mountains and mineral springs of our State are destined to have a larger and larger importance as the populations of the valleys grow more dense on either side.

As a producer of lime for fertilizing, our State is advancing rapidly. The most valuable deposits of very pure lime in our State are in the counties of Jefferson, Berkeley, Hampshire, Hardy; Greenbrier and Monroe. Valuable magnesian lime suitable for hydraulic cements, occurs also in these counties.

Clays, of nearly all the coarser grades, are found in many parts of our State; but as the value of these are to be known only by trial, little need be said of them.

### MINERALS.

In metallic ores, we are singularly deficient. With the exception of manganese, whose value is yet to be determined, we have hardly anything to be called valuable, unless it may be some deposits of ochre. Silver and gold, have we none. Of copper, we have only a trace. I have found lead in specimens sent for examination from the counties of Berkeley, Morgan, Hampshire, Preston, Webster, Clay and Kanawha, but in none of these in quantities to be of value. I have found zinc in specimens sent from Randolph and Hampshire, but not in valuable quantity.

I have found barite, or heavy spar, in specimens sent from Jefferson and Randolph. This, if in abundance, may prove of some value, as barite is worth from $3.00 to $4.00 per ton.

Our iron ores are not valuable, and should not be counted an important natural resource. The best we have only yields about 52 per cent. metallic iron, and this percentage, under present conditions, is no longer counted valuable, unless it should be at the very furnace mouth. And our iron ores that are of that quality are in the counties of Hampshire, Grant, Pendleton, Hardy, Pocahontas and Greenbrier, far from water transportation. Our iron ores that are in the coal bearing and river counties only run from about twenty-five per cent. to forty-five per cent. in metallic iron. Ore of better grade than that forms the rubbish dumps in the iron ore regions of Lake Superior, and in Missouri. So we can hardly hope to grow rich from our native iron ores.

Our river counties will become the seats of great manufacturing industries, and among these will be those of iron and steel, but it is doubtful if our native ores are to be used to any considerable extent within the lifetime of any one now living.

Among the building stones, our resources are limited to limestone and sandstone. The sandstones are the ordinary coal measure gray sandstone and the blue and brown sandstone of the older formations. The brown sandstone of Summers county is of singular excellence, and ought to become one of the most fashionable building stones of our country. Of glass sand we have also a great abundance and of great excellence.

But after all these products of the field, the forest, and the mines have been catalogued, there still remains the most important of the natural resources of our State—our people. About eighty per cent. of our people are of the old American stock. They are descended from the biggest-boned and biggest-brained people of northern Europe, and have been the longest identified with the problems of self-government and of progress of any of the English-speaking people of our continent. No catalogue of our natural resources would be complete if our people were omitted.

## ORIGIN OF THE SOIL.

Of all the layers that make up the crust of the earth, none are so valuable and none so full of potential wealth as the soil. It is the gift of the ages, and the most precious inheritance of all nature's gifts.

Never before, perhaps, has it been so clearly perceived that the roots of our society, like those of a tree, strike deeply into the fertile earth, and draw thence the nurture which maintains all its springs of life. The very close relations which civilized man bears to the soil makes it necessary that this most precious in heritance which he has received should be preserved by spreading as rapidly as possible the knowledge which science offers, and should be guarded by the most stringent laws which the State can make effective.

The farmer who imperatively needs to know something of the earth with which he is dealing, is compelled to rely largely upon personal or traditional experience as a guide to his conduct.

And this is usually most excellent, for it was derived from observation and experiment, and is, therefore, in the fullest sense scientific. But, it is usually limited, both from being drawn from too small a field and from too narrow an experience. That is particularly the case in our own country, where few families have occupied their lands for more than one or two generations. But, in the older civilizations it is quite otherwise, for when many generations have tilled the same lands for centuries the mass of accumulated knowledge handed forward becomes very great, and, indeed, of more use than any knowledge gotten from general treatises could possibly be.

Now, the effect of this ancestral experience in such old cultivated lands is commonly shown in the preservation of the original fertility of the earth or even in the enhancement of its returns by the skillful management which it receives. Public sentiment is well awake to the value of the soil, and such people have learned how to husband and increase the soil capabilities and to repair its waste. This, we are told, is the way among many of the people of Europe who are not especially educated, but the very peasantry have learned from their fathers and from their own experience the essential facts about the care of the soil.

Among our own people the migration from place to place and the frequent change of pursuits have prevented the great majority from acquiring that close and exact knowledge about the soil of particular districts that is so valuable in older countries.

And our people who have been reveling in the luxuries of a virgin soil, the product of thousands of generations of plants and animals have usually moved away to a new district as soon as the soil of each plantation began to fail. But, that time for our people is gone, and to supply the lack of accumulated knowledge, such as has been gathered by the people of older countries, we have the agricultural colleges and agricultural experiment stations, doing a work more complete and more far-reaching for the good of the race than any similar work ever projected by a government. The time has come when we must apply ourselves to the study of soils and the preservation of them as other people have done.

The greater part of the soils of the earth in their natural condition are forest-clad, although large districts also are in the condition of the prairies.

Let us turn to the woods, and select a handful of soil from an inch or two below the surface, soil that perhaps has not been disturbed for a century. We see it in two distinct kinds of materials; one part is evidently made up of decayed vegetable matter, in which dim forms of leaves and twigs can be seen, and from these the vegetable matter shades down to less and less distinguishable forms until it ends as an undistinguishable blackish mould.

Mingled with this dark mass of rotted vegetation are seen more or less distinct fragments of a stony nature in the form of sand or pebble matter; if the sample were secured from the lower part of the soil the fragments will always be evident, if not to the eye at least under a simple lens. Observing them closer, we will see that however small, they are more or less angular fragments of rock, generally a good deal decayed on the surface, often so much so that they fall in to dust at the first touch. The glass will show that the process of decay is at work on all these fragments along their structural planes, joints and cleavings. Now if we take a rock and break it up into an equally fine state of division, the grains will not exhibit the same rotten condition that the grains in the soil exhibit. This shows then that some other force than mere mechanical force is at work among soil particles.

Now, let us see, if we can, what the soil is. Let us take a handful of rock drawn from several feet below the surface, and reduce it to a fine state of division by crushing until it appears like sand or dust. Let us then put in some wheat or some other grain and moisten it with rainwater. The grains will be seen to germinate and grow, but they soon begin to appear stunted and will fail to produce their fruit.

Now let us take decayed woody matter, such as forms the other component of the soil and plant wheat in it, but carefully exclude all mineral substances from it.

Here we see again the plants for a time grow as before, sustained by the nutriment in the seed, but these also fail and wither and refuse to mature.

But in experience we see just such examples before us on every farm. Here on some point the wind and rain have long ago removed the proper soil. Seed falling here remains dwarfed and unfilled if it grows at all.

In another place a deep mossy bog has been drained and seeds have fallen into it also. They germinated and perhaps grew with unusual rankness; after the crop in the rest of the field is ripe, their tall rank stalks still remain green; if they are examined, the heads will be found empty. It is necessary to burn off this thick muck, or to wait till it has decayed so thin that the plow can turn up some mineral matter and mix it with the vegetable mould before any fruitful crop can mature upon it.

And so whatever may have been the origin of the soil, these two admixtures must always be present, viz., a part of its volume must have been derived from the decay of the firm set underlying earth, and a part from the decayed fragments of plants and animals.

It is on the adjustment of the proportions of these diversely originating materials that the suitability of soils for certain crops depends. These proportions themselves depend largely upon the relative activity of the various natural agents at work in producing them.

And so experience has shown that no plants having nutritious seeds or fruits, none yielding strong fibres or endowed with the qualities making them immediately valuable to man, or useful to him because they serve the needs of food for his domesticated animals will flourish in a rock soil alone, nor in a soil whose muck or swamp is so deep that the roots of the plant will not reach down into the decomposed rocky detrital matter beneath it. It is made plain, too, by these observations that were it not for the conditions which afford this admixture of the debris of the stony rubbish and of organic bodies, the higher plants which afford subsistence to ourselves and nearly all the animals would have no place on the earth. We see from this that the relations of the higher animals to plants makes it evident that all the advance of the earth's life above its simpler forms depends upon the existence of moderately fertile soils such as produce food fit for the life of the higher forms.

The higher forms of animal life, so far as we know it by its limitations, could never have developed at all if the world had not provided a better matrix for their food than the lichens of the rocks or the mosses of the peat swamps. We now begin to see that the soil is really the immediate source not only of the superior kinds of plants which feed in the soil, but also of the animals which depend upon them.

If the plants, such as those which produce fruits, grains, or nutritious herbage, had not had this rich bed, this well-proportioned mixture of decayed rock and decayed vegetation, the chances are small that there would ever have been the noble classes of animals on which we have depended for our advancement, or that man himself could have grown to be man.

But important as the soil appears to be to the mammalian forms of life, it is hardly less important to the insects and birds. For the food for the vast majority of these that we know, also depends on the flowers and fruits of the plants that grow out of a well mixed soil.

Now, as the roots of the trees penetrate below the immediate soil layer, they creep about and discover the crevices in the rocks; they crowd them apart; their absorbent roots dissolve out the soluble substances in them, the process goes on year after year; the trees die of old age; their roots die with them; the decay of these roots adjoining the rocks, furnishes more acid material for the destruction ef the rocks; the wood acids attack them, and for several inches around each root may be seen a layer of rotten rock. The roots of the trees are deepening the soil layer.

But this is not all. Long after the wood of the roots has decayed and dissolved, and has been carried away by the circulating waters, the ancient root holes, extending several feet below the surface, still act as pipes and carry the surface water, saturated with vegetable acids, down among the decaying rocks, and so the work goes on. As the trees are always growing, or always dying, and the rain falls forever and sinks through the vegetable coating at the top, it carries deeper and deeper the true soil layer, and the sub-stratum, or sub-soil layer, is constantly growing into a true soil and thus replaces from below material as fast as it is wasted from the top. And thus the renewal of the soil depends, in a singular way, upon the destruction of the rocks. It is to the ceaseless wearing down of the land that we owe the formation and preservation of the wonderful mixture of decayed rock and organic matter which forms our soil. This is one of the most beautiful and significant facts of nature, and it shows us that the processes which we term destructive and associate with death are in fact but steps in the system of advance which lead matter from the lower mineral states to the higher conditions of organic forms.

But one of the moral functions which the science of geology has to perform is to teach the origin and history of the soil, for when this is well taught the attitude of men toward the soil which has borne them will change; "it will bring them to a clear recognition of the marvel and beauty of the mechanism on which the existence of all the living beings of the earth intimately depends. In no part of this great work of ordering and ennobling nature in our understanding is modern learning doing a better or more profitable work than in lifting the veil of the commonplace with which long and ignorant familiarity has wrapped this earth, hiding its dignified meaning from the understanding of man." No sooner is this inquiry begun than the mind ceases to look upon this earth as dull matter of course. For many reasons the soil cover is one of the best with which we may begin.

We have already seen that true soil is composed of an admixture of vegetable matter and decayed rock material. The vegetable portion comes from above the soil layer and from the roots of the vegetation contained in the soil itself. The rock supply exists chiefly underneath the soil layer, and must necessarily be attacked through the layer.

Now water is the principal agent in the attack upon the rock layer beneath the soil layer, and this water is charged with various acids and gases that it has gathered in its descent through the air, in its descent through the leaves, in its windings among the roots in the soil itself.

It is then plain that the more water flows over the surface of the soil without entering it the more soil will be washed away, without any renewal of it; but the more water can be induced to enter the soil and sink deeply through it into the rocky layers below it the more rapidly will the soil deepen itself. This is effected in many ways. Not the least important is that of freezing. At all temperatures above freezing the soil water is in constant activity, creeping here and there through the interspaces or capillaries of the soil, dissolving, distributing materials and yielding them to the demands of the roots. As soon, however, as the frost seizes it all these functions cease, and the water becomes as rigid as stone, not only dead itself, but locking also all the life of the plants in a deathlike embrace. The frozen condition of the soil means the complete suspension of all of the mechanical, chemical and vital operations which constitute its physiology. The results of this condition, if continued long or if frequently repeated, are very wonderful.

When the water changes into ice it expands to the amount of one twelfth of its volume. This causes a crowding of the stones and roots that occupy the soil into slightly changed positions. It causes a bulging or heaving of the soil layer itself so that it sounds hollow when walked upon. The ground water beneath the frozen layer no longer being supplied from above, flows away from beneath it and leaves its usual courses empty. Every one will remember how very soft the ground is after the frost has gone out of the soil. What is the reason of it? The separation of the particles that have been crowded apart by the freezing still continues even after the frozen layer has thawed. This allows the air to penetrate completely the soil layer, and allows the roots to extend their gropings throughout the moist earth. Not only does the action of freezing water profoundly affect the conditions of the soil in the ways above mentioned, but it also does other work. It has a powerful effect in disrupting the rocks whose texture it penetrates. Wherever the rocks are set on edge the water penetrates the invisible crevices and after the freezing and thawing of one winter the rocks split easily along their stratification or cleavage planes, often by their own weight alone. The result is that at every thaw the blocks and slabs drop from the edge of the cliffs, wedged off by the irresistible power of the expanding ice. But, the work does not stop with simply loosening blocks from the face of the cliff and dropping them to the talus below. If the rock is fine-grained and stratified, the water enters the stratification planes, and freezing, it wedges off slice after slice from the rock until the whole is reduced to small fragments. But, if the rock is coarse-grained and of open texture, the water enters this open structure and, freezing, the rock scales off little by little until the whole mass is reduced to a heap of sand. So ravenous is the attack and so resistless are the effects that many building stones that are regarded of superior excellence in the tropics soon show signs of destruction when brought under the influence of freezing and thawing water. A remarkable example of this is the syenite obelisk, Cleopatra's needle, that had been carved out of a single stone in Egypt. It was covered with hieroglyphics that had endured under the climate of Egypt without much loss for 2,000 years or more. Some fifteen years ago it was brought to New York and set up it Central Park, yet with the first freezing it began to scale off and it has now, perhaps, lost more in fifteen years in the climate of New York than in 2,000 years of Egyptian climate, for its hieroglypics will soon be gone.

But this mechanical scaling of the rock prepares its particles for the chemical action that will begin upon them as soon as they reach the grass roots. It exposes more surface for the acids to act upon. Let us examine this statement a little more minutely. The chemical forces act chiefly upon the outside surfaces of the rocks, so that as the outside surfaces are increased in area the chemical solvents will act with more rapidity.

Now when a block of a cubic yard falls from the cliff it furnishes a surface of 54 square feet for chemical action to work upon; but if this block divided into blocks of one square foot each, there will be 162 square feet of surface exposed. If it is broken into cubes of one inch size the total surface exposed will be nearly 2,000 square feet. If it is still further reduced by dividing it into bits of 1-12 of an inch in diameter the exposed faces of the rock are increased until they offer nearly 20,000 square feet of surface to be acted upon by the dissolving agents and thus the frost action aids in comminuting the rock, for it reduces it from great boulders to sand, to soil particles, and it leeaves the soil also an open textured mass in the spring instead of a compact solidified mass, and thus it aids the free entry of air, of water, of warmth, for it stirs the soil by its movements from year to year.

Let us now regard for a few minutes the work of some of the humbler animals in the preparation of the soil.

If we go out into the yard and pick up a flat stone we will most likely discover that we have lifted the roof off of the home of a whole community of humble creatures. They have hollowed out perhaps several cubic inches of earth from under the stone. This earth they have brought to the surface and in consequence the stone had sunken almost level with the surface of the ground. Let this work go on year after year until a sufficient quantity of earth has been removed from under the stone and placed on the surface around it and we find that the stone has completely disappeared from view; it has settled below the grass roots and is receiving the full energy of the acids that are developed from the decaying vegetation. Now the earth workers, the ants, and the crickets that live under the stones upon an acre of ground are numbered by the hundred thousands, and the work they do year after year results in lowering the stones that lie upon the surface until they are completely buried beneath the sod. Nor do they stop with the loose stones upon the surface.

When the foundations of buildings are not sunken to great depths, the insects and worms undermine the foundation stones, they hollow out cavities under the stone floors of ancient buildings until the floors themselves settle into uneven surfaces from the silent work of the patient miners below. But the earth worm does not only remove the earth from underneath the stone, but it eats it. In the stomachs of the earth worms are certain hard parts which act as mill-stones in grinding up and pulverizing the soil. After this is reduced to a fine mud by digestion it is strangely enough brought to the surface and deposited; the work done by the earth worms in a damp soil is said to be sufficient to deposit an inch of this material completely over the surface in ten years; or that the earth-worms will work over the tillable soil to the depth of ten inches once in a century. But the material that an earth worm has digested has been reduced to a very fine state of division, and is indeed in the best possible condition to be utilized by plants.

It now seems plain that the soil is not a mere mass or mixture of unrelated materials, but that it is indeed a well organized part of nature which has beautifully varied and adjusted its functions to the forces which operate upon it. It is the realm of mediation between the inorganic and the organic kingdoms, and it seems by the variety of its functions more akin to the vital than to the lifeless part of the earth. Indeed it does not seem unreasonable to compare its operations to those of the plants which it sustains, for in both there are the harmonious functions which lead matter from the lower or primitive condition to the higher state of organic existence.

Let us now consider the mode of growth and the prospective value of certain of our soils that are as yet but little utilized. The part of these that we will consider will be the soils that will accumulate about the bases of cliffs. As we have an abundance of soils of this character in our State it is a matter of great importance to land owners to know how they may be utilized to the best advantage. These soils are usually extraordinarily rich, but are so covered with new bowlders from the face of the cliffs that it is impossible to cultivate them to advantage. In their native condition they usually support a splendid crop of forest trees, poplars, chestnuts, oaks, linden, and ash trees. Frequently these are bound together by the most luxuriant crop of wild grapevines. Perhaps, if timber reserves are to be left on farm lands the very best uses that could be made of the talus slope would be to leave it in its crop of luxuriant forest. But in many instances the talus has already been cleared. Nature has pointed out to us how best to utilize when cleared. Plant it in vines, in raspberry bushes, in orchards; it is peculiarly suited to orchard and viti culture but not to the growth of cereal grains. With advancing culture and increase of population it is certain that these now neglected talus slopes will become valuable possessions; for similar soils form many of the most celebrated vineyards in Switzerland.

Let us next consider the soils of the swamps. We have in our State perhaps less swamp soil than any of the States east of the Mississippi river, yet if it were reduced to cultivation it would amount to many thousands of acres.

A soil may be defined as a swamp when the air is constantly excluded from it, and the interspaces are occupied by water. In our State the swamps may be classed under two heads, viz, the back swamp of bottom lands, aud the swamps that cover the flat lands on the plateaus above the head waters of our numerous rivers.

The back swamps of our rivers and creeks are usually separated from the stream that formed them by a low ridge of alluvial earth between the swamp and the river. They are sometimes difficult to drain, but when this is effected they furnish a most fertile soil, for they usually have a goodly amount of finely divided mineral matter mixed with a generous portion of well rotted organic material.

Some of the noblest cornfields along the Ohio River have been such back swamps that have been well drained. At times when the ox-bow of the river becomes so narrow that the river breaks across and occupies a shorter channel; the long curved channel that was abandoned, is turned into a lagoon, afterward fills up to be a swamp. The nature of the soil of this lagoon swamp would be of the same valuable character as soon as it should be drained as that of the back swamp of the river divide swamps.

The great fertility of the prairie soil of the Mississippi Valley has been a matter of wonder to those who first occupied them. It is not difficult of explanation. They were usually nearly level and thus were subject to much less loss than the soils on the hill sides. Having been accumulated through the ages they were deep. As fires swept over them almost every year, the burning of the rank growth of weeds and grass returned to the ground considerable quantities of potash, soda lime and the phosphates in soluble condition for the use of grain growing plants. As the rainfall over the prairies is but about one-half of our rain fall in West Virginia and these deposits of soluble substances were not removed as fast as they formed in their natural condition, the soil grew richer and richer year by year. But when they were plowed they yielded into the cereal crops in a few years a large share of the plant food they had been storing up through so many centuries. The surprising returns they yielded at first have not been very enduring, and after one generation of cropping they are now only yielding only about one half to one third of the amount they yielded at first.

As the roots of great trees had never loosened the soil of the prairies to great depths there was not a deep subsoil constantly advancing toward the true soil conditions as is the case in forested regions. The work that the tree roots do may be partly replaced by deep plowing and thus allowing the air and water to penetrate so that new mineral substances will be attacked and dissolved.

Now where tillage, without due regard for the needs of the land has led to the destruction of the superficial layer, or soil proper so long as the subsoil remains, the damage may be repaired, if pains be taken to clothe the land in clover or other grass as soon as possible.

But where the subsoil, as well as the true fertile layer has been swept away, the field may be regarded as lost to the uses of man, so much so as if it had been sunk beneath the sea, for it will in most instances require centuries before a new soil equal to the first can be formed upon it. The loss of the soil from the land is the most grievous misfortune that can befall any neighborhood; no fire, however, destructive approaches it; no war, however deadly, equals it; if a pestilence should sweep through a neighborhood, and the last inhabitant should die of it, this disaster would not equal the loss of the soil; for if the soil remained after the pestilence other immigrants would occupy it as before; but when the soil washes away all culture and civilization, all life itself is ended in that district; it becomes a desert, destitute both of plant and animal life.

Now with this condition before us, why are people so reckless with the soil? We insure buildings against fire, yet buildings are not so valuable as the soil. The chief causes of this danger to the soil is the reckless attempt to cultivate land which is essentially unsuited for plowing. Land which slopes as much as five degrees is certain to lose something when it is cultivated, let it be worked as carefully as possible. But when it rises to ten degrees, no such land should be plowed, but should be kept in grass, in orchards or in forest.

## OUR DUTY TOWARD THE SOIL.

From what has been said thus far it is seen that the soil is the very workshop, the laboratory of life. From it comes the food of plants and animals, both of the sea and the land. The frame of man is the product of its forces; his form is indeed but a bit of soil uplifted for a moment to the noblest shape of life, then bidden to return to the garner of the earth. When we perceive that civilization rests on the food-giving capacities of the soil, when we perceive that all the future advance of our kind depends upon the preservation and enhancement of its fertility, we begin to see that we have a great duty to perform toward the soil. This obligation bids us to protect and care for this part of the earth with an exceeding tenderness and affection.

It bids us ever remember that it is enriched with the dust of our progenitors, and is teeming with the life which is to come.

Now it is only through knowledge can we hope to bring men to a proper understanding of the value of the trust which is in their keeping. Until by education we bring people to a consciousness that the wanton neglect of their duty to their kind which an improvident use of the soil reveals is a form of treason to mankind, we can not hope to implant in them a proper sense of responsibility in the management of their great inheritance.

The other great natural resources of the earth, as the forests, the products of the mines, the flow of natural gas, are protected by law and the rights of property are regarded as far as possible. Not so with the soil, more precious than any of the others. Our land laws have not yet been framed with sufficient precision to prevent destruction of the soil. As long as lands are in the state of forest or prairie, the admirably adjusted forces of nature will insure the preservation. When they become tilled, it is imperative that they be peculiarly well guarded.

## DISTRIBUTION OF THE SOILS OF WEST VIRGINIA.

Agriculture in West Virginia is advancing. Although not keeping pace with the progress made in some of the arts of practical life, nevertheless the agriculturist is bestirring himself and beginning to ask what the various sciences that have done so much for other pursuits in life can do for him. Geology, that for a century and more has been of such great value to the mining engineer, to the civil engineer, to the sanitary engineer, to the chemist and to the architect, is beginning to be reorganized also in its correct relation to the business of farming.

In the earlier years of a new State, while its virgin soil produces such an exuberence of crops, it is hardly realized that this happy condition of affairs will not always continue. Every garden is one of nature's chemical laboratories. But, even nature's chemists can not work without materials. Now, as the surface materials are being constantly exhausted, it is necessary for new soil to be made by the slow disintegration of the rocks, the shales and clays.

The geological sub-structure then furnishes the soil of each field. The soil of our wide, flat-topped hills is formed by the freezing and thawing and dissolving of the rocks that make the hills, together with the decay of leaves, the logs, and other vegetable matter. This decomposition of the coarse material is hastened by the action of roots creeping into it, by the acids from the decaying plants dissolving the soluble parts, and at last is still more finely comminuated by wood worms and the earth worms grinding it up ready for the plants. A soil produced in such a manner is a soil of *disintegration* and is usually not far distant from the parent rock that yielded it.

The soil along our river valleys and creek "bottoms" has been carried there from anywhere within the basin of the stream, and is consequently a mixture of whatever beds outcrop in its basin. Such a soil is called a soil of *transportation*, and from its depths and variety of materials is less liable to rapid exhaustion than a soil of disintegration, such as is seen on the hilltops.

Now with the exception of a small amount of soil brought into the State from the head of New River, aud a slight fringe along the Ohio brought from Ohio and Pennsylvania, all the soils of the State, both soil of disintegration and soils of transportation, are from rocks native to our State. Hence, whatever soil has been exhausted can be repaired from materials close at hand in each neighborhood. West Virginia has none of the soils of transportation which the great ice sheet brought over the states to the north and northwest of us. Nor have we any of the dry, crumbling soil which is usually so fertile, that comes from the decay of the traps and other volcanic rocks, nor any of the marl beds so valuable along the coasts of Virginia and New Jersey.

Our soils are all native and come from native rocks which are limestones, sandstones, and various admixtures of shales and clays forming respectively calcareous soils, sandy soils, clayey soils, and loams.

Now, the availability of land for farming depends upon two factors: First, quaility of soil; second, topography. As we have shown that kind of soil depends intimately upon the kind of underlying rock in each locality, so we also can show that the topography depends quite as intimately upon the structure and direction that each geological formation has assumed in each locality.

In altitude, West Virginia varies from 300 feet to 4,500 feet above the sea, the surface of the eastern half being composed of somewhat parallel ridges running from the northeast to southwest. These ridges are usually great arches or foldings in the different rocks, the tops of the folds forming the ridges and the troughs between the folds the long valleys. So, that in passing from east to west, one quickly passes from one geological formation to another, while in passing toward the southwest or south, one travels a long distance on each formation, and it is soon evident that each formation extends in a long, narrow belt in the direction of the mountain ranges of the Appalachian system.

Where the great sandstones stand at an angle, the streams have cut their channels far below the general level of the surrounding country. The ridges are sharp, the sides steep, and the whole topography is rough, and farming is impracticable. When the principal rocks are limestones and shales, these weather down more regularly, the slopes of the hills and valleys are rounded, the outlines softer, the surface smoother and the topography more suitable for farming. Shales and limestones hold more fertilizing material than sandstones, and also yield their soluble parts more readily for the use of plants; hence they make more fertile soils.

With these preliminary general remarks we will now proceed to sketch roughly the parts of our State occupied by the principal geological formations that are of most importance to the agriculturist.

To make this more intelligible, a good geological map of the State should accompany this report, but unfortunately, as the State has never had a survey made, no accurate map is in existence.

Beginning in the east with the lowest and consequently the oldest rocks of our State, the first formation of importance to the farmers is the great Trenton limestone. It is named Trenton from Trenton Falls, N. Y., where it is first studied and described. It extends entirely across Pennsylvania and Maryland, through Jefferson and the eastern half of Berkeley counties, West Virginia, and continues on through Virginia, making the Valley of the Shenandoah, between the Blue Ridge and North Mountain, a region excelled by none for its farming capabilities.

The limestone stands usually at an angle of about 30 degrees. which causes the surface water to seek underground channels, until suddenly it gushes forth from some large spring with power enough to turn a mill. Such is the big spring that furnishes water for the city of Martinsburg. The surface is also characterized by sinks here and there, which often are filled by ponds of water, the explanation being that subterranean drainage has dissolved passages and caves through the limestone, which finally, growing larger, allowed the surface to "cave in," forming the sinks we see. The area made by this limestone is, all things considered, the best for farming purposes in the State. Most of the cereals grow well, but it is particularly adapted for wheat, 40 and 45 bushels often growing on an acre. The following analysis of this limestone from near Harper's Ferry we find in Roger's report on the survey of Virginia: Carbonate of lime, 95.86 per cent; carbonate of magnesia, 1.46 per cent; silica, 1.83 per cent; oxide of alumina, water and loss, .85 per cent. Near Shepherdstown it has a larger per cent. of magnesia in it, and is consequently valuable for cement. It is gratifying to know that limekilns line the railroads passing through this district, and that yearly hundreds of carloads of lime are shipped over this and other States from this exhaustless source.

Above this limestone are dark colored bands of shales that weather into a regular topography, and the "slate farms" lying upon these are easily made fertile by applications of lime from either side. This limestone is, according to Rogers, exposed in but one other locality in the State, and that is along the South Branch of the Potomac in Pendleton county.

The next rock of first importance coming westward is the Medina sandstone, which because of its indestructible character and the manner in which it is tilted and folded together, is a great mountain-maker. Its talus is of coarse, hard fragments, having little in it to support plant life, consequently thin, siliceous soil and scrubby forests fringe its outcrops. It is seen on entering the State from Maryland, near Cumberland, and continues south through Mineral and Pendleton counties.

Some distance above the Medina sandstone and following its outcrop is another great limestone called the Helderberg. The lower part of it is valuable as a hydraulic cement bed and is quarried and manufactured into cement in large quantities at Cumberland, Md. The limestone is of great thickness and may be seen well exposed along the railroads from Cumberland to Keyser, W. Va. It is exposed over large mountain tracts throughout the eastern part of Mineral, Hampshire, Hardy and Pendleton counties, and by burning may be made of great use to the farms situated upon the neighboring shales. The "Knobly," Patterson's Creek, Capon and North Fork all show extensive exposures of this limestone It is very fossiliferous, and compact pieces of it, when freshly broken, give out a strong odor.

The next member of the series and resting immediately upon the Helderberg limestone, is the Oriskany sandstone, a coarse, friable rock, easily weathering into yellowish-white sand and containing an abundance of fossils, particularly Spirifer Arenosus, which is the commonest. This rock makes the high cliffs seen from Keyser, and the celebrated Hanging Rocks, near Romney, and continues on through Hampshire, Hardy, Pendleton and Pocahontas counties. It exhibits great white patches of bare rock which attract attention from long distances, and the arid soil it makes upon disintregation, and the wild topography it gives the surface, show its unsuitability for agriculture.

Next above the Oriskany sandstone are the Hamilton shales that in this State have an extensive development and are exposed over wide areas. They are made up of a great thickness of shales alternating frequently with thin layers of sandstones which readily break down into soils and make a gently undulating topography. Wherever exposed, the strata are tilted up and often highly contorted, which furnishes an explanation of the many warm springs that occur along their outcrops. These shales are also charged with an abundance of mineral matters, particularly iron pyrites, which accounts for so many of the springs being sulphur springs. The soil made by these shales is usually good, but, according to Prof. Fontaine, would be benefited by applications of lime to correct its acidity.

The Hamilton shales may be seen at Elkins, in Randolph county, making a wide valley, and are largely exposed in Hampshire, Mineral, Hardy, Pendleton, Pocahontas, Greenbrier and Monroe counties. They form the region about the White Sulphur Springs.

The Chemung and Catskill rocks are characterized by great ledges of massive sandstone, usually reddish or olive colored, that weather into red soil. In several places, notably at Rowlesburg, in Preston county, they are quarried for excellent building stone. They follow the western range of the Allegheny mountains southward through the State and are not of great importance from the point of view of the agriculturist.

The next rock of great importance is the Mountain Limestone which starts in Monongalia county, on Cheat River, and continues up that river through Preston, Tucker, Randolph, Webster, Pocahontas, into Greenbrier, Summers, Monroe and Mercer, spreading over wide areas in these southern counties. From the northern part of the State, where it is but 150 feet thick, it developes greatly toward the southern counties, where it is 900 or 1000 feet in thickness. It is of sufficient purity to be used for agricultural and other purposes, as an analysis of half a dozen samples from different parts of the State show carbonate of lime about 90 to 96 per cent. This limestone contains passages caused by underground drainage and has numerous caves in it, particularly in Greenbrier county. It weathers into a pleasing topography, as the fine farming districts of Greenbrier and Monroe will convince one.

The next rock of great importance in our State is another mountain-maker—the Great Conglomerate, or Millstone Grit. Whether it shows its head above the surface it makes a wild topography and contributes very materially to our celebrated scenery. Its outcrops are usually skirted by a magnificent growth of timber—chestnut, poplar, oak and walnut: yet the "rock cities" it makes even at long distances from its present outcrops, and the steep sides it gives to the hills, make farming impracticable. It forms the top of Chestnut Ridge, Laurel Hill, the main axis of Backbone Mountain, and continues southward, thickening as it goes. From about 200 feet on Cheat River it increases its thickness to about 1400 on New River. It makes all the principal waterfalls in our State, notably the falls on Decker's Creek, Tygart's Valley Falls, the Great Falls of Blackwater, and the Falls of the Great Kanawha. It extends through the counties of Monongalia, Preston, Tucker, Randolph, Webster, Nicholas, Fayette, Raleigh. It makes lines of bold cliffs along Cheat River, Tygart's Valley and New River, the Hawk's Nest on the last-named river being famous. The Great Conglomerate furnishes the purest water in the world, and all towns that are in reach of it should be supplied with water from it.

The remainder of West Virginia, comprising the western two-thirds of it, is formed of the coal measures whose structure is made up of alternating layers of shales, sandstones, fire clays and coal seams. These strata are almost horizontal, but usually with a small dip to the west, and as the streams have worn deep channels in every direction, this is known as the "hilly region." As the strata are almost horizontal, each sandstone forms a bench around the hills and each impervious layer, as fire clay, has a line of springs coming out from it, so that there are springs almost to the tops of the hills. These soft shales and sandstones weather into a deep, rich soil on the tops of the hills, but the hillsides are often so steep that the wash after a few plowings robs them of almost all their soil, and landslides often occur, carrying down many acres at once. Prudence would indicat that these should be left covered with vegetation, or if cleared, then kept as pasture lands.

In the northern part of the State the limestones of the coal measures are numerous, and in the vicinity of Wheeling are of great thickness, being in the aggregate 150 feet in thickness, and of sufficient purity for agricultural purposes. But upon going southward it is noticed that the limestone beds grow thinner, until on crossing the Little Kanawha River they have almost disappeared, or are only represented by marly shales, while the sandstones have correspondingly thickened and have grown massive.

This fact makes the country to the southward have a sharp, angular togography, with higher hills, but illy suited to farming; such as may be seen in the southern half of Roane and in Kanawha counties. But these high hills are covered with excellent timber, and are well adapted for grazing purposes.

It will be seen from this very hasty review that we have in this State four great limestones of the highest value. The Trenton and Helderberg in the eastern part of the State, the Mountain Limestone through the central and southern part, and Great Limestones of the Coal Measures in the northwestern counties, so that materials are at hand for the repair of land in every district.

We have three great sandstones: The Medina, the Oriskany and the Millstone Grit, all forming a rugged topography and making bold cliffs and mountains and furnishing a cause for the name of Little Mountain State.

There is one natural fertilizer not particularly connected with any geological formation, but found on the cold uplands of Preston, Tucker, Grant, Randolph, and perhaps in other mountain counties, and that is the peat now forming in the shady swamps, which could be used with considerable advantage, on soils deficient in carbonaceous matter. In some of the northern states, and particularly in England and Scotland, great account is taken of this material as a fertilizer. It is usually dug out and allowed to dry until it becomes crumbly, when it is applied as other manures to the fields.

Morgantown, W. Va.,
July 28, 1900.

# BEEF PRODUCTION IN WEST VIRGINIA.

BY P. S. LEWIS, PT. PLEASANT, W. VA.

Those who desire information as to the statistics relative to the cattle of West Virginia—their number, value, etc.—are referred to the soon-to-be-completed labors of the census bureau. But, Uncle Sam will not be able to tell us how many more cattle we should have carried on our pastures, nor how much more money they would have been worth if the cattle had been of the right kind. The writer of this article wishes to be clearly understood that it is not written in the interests of any one of the various breeds of cattle. All of the valuable beef breeds of cattle originated and were developed in England and Scotland, and in that little island they found in the shaggy Galloway, with his fur robe and hardy constitution, the animal to suit the Grampian hills of the North of Scotland—his near kinsman, the Aberdeen Angus, with the active Devon and Red Poll for the middle regions, as well as the Hereford and Shorthorn to graze the rich pastures of Southern England, we may agree that there is in our mountain State room for one and all of them. The one essential thing so badly needed, so much to be desired, is for the farmer and grazer to have that breed of cattle best suited to his locality, and that will most profitably convert his grass, hay and corn into high-priced beef. In confining this discussion to the beef breeds of cattle and leaving out the milk and butter Holstein and Jersey, the writer intends no depreciation to them, for their value for their special use is well known, but it is just as well known that they will not do to cross on cattle intended for beef. On the other hand, the beef breeds of cattle not only grade up the scrub, but will cross on each other to the benefit of the owner. The prime Scotch beef which satisfies the critical taste of the best judges in the world of good beef, and outsells any other in the London market is the outcome of a cross of the southern bull on the Polled Angus grades. Also witness the testimony of the largest cattle owners of our great West that on a foundation of shorthorn grades is obtained the best results from a Hereford cross.

But the scrub of the West Virginia hills and mountains that weighs at maturity but little more than should be expected from a well kept eight or ten months old Shorthorn calf, and that is without a single redeeming good quality must follow to extinction the Texas long horn; and the sooner the better for the interests of the land owners. And here it may be pertinent to suggest that one of the difficulties to be overcome in accomplishing that much-to-be-desired end, is the feeling so common that a man who has a decent bull is not a good neighbor who withholds him from free use by those who have none, and that without charge for services. This is most discouraging to the enterprising farmer who thus invests his money, and if continued soon ruins the bull. The owner of a stallion justly expects a fee—if only a small one—for every colt, and there is no reason why the buyer of a good bull should not be encouraged by the paying approval of his neighbors. It is often remarked, and apparently with good reason, that farmers are the class of people hardest to get to work together for their common good. It would seem like a business plan for several neighbors to join together and buy a first class bull and use him for improving their cattle, rather than for each one to own an inferior animal. Let one keep him and be credited with all it is worth to keep him well, let the others take their cows to the bull, and every year settle up fairly on basis of services rendered and received. The increased value of each crop of calves would probably pay for the bull. But the bull must be properly treated—have his separate lot and stable, and be well fed and cared for, as much will be expected from him. The first cross of such a bull as this should be, works wonders on the scrub cow, and lays the foundation for continued improvement.

Our Mountain State is best known to the world by its vast area of coal of the best quality; by its oil fields daily pouring out thousands of barrels of oil of the most valuable kind, and by its grand forests of hardwood timber. With a world demand for our coal and oil, we can look forward to the building up of our cities, towns and villages; to a profitable use of our railroads, built and under way, and to the consequent growth of our population, which will supply good home markets for all the beef our cattle men will have to sell. With the present high price and demand for lumber and increased facilities for getting it to market, it is only a question of a few years when our forests will be a thing of the past, and then what is to take their place? On the rough mountain sides nature will re-assert her power and clothe them again with a growth of young trees, but on the benches, on the table lands, and in the fertile valleys will not the land owners do their part to cover their acres with the living green carpet of a good sod that will graze more thousands of cattle to feed the hungry mouths that will then be all around them. If they will avoid the too free use of the plow and consequent wash of the fertility of the soil into the Ohio and Potomac rivers and use every needed effort to find the grasses best suited to their soils and climate, West Virginia may yet be as famous for the number and quality of her cattle as she is now for the fine sheep and wool in the Panhandle counties. With a limestone soil in the region extending from Monroe, Greenbrier and Pocahontas in the south, to Lewis and Harrison in the north, our State has in them a section equaling Kentucky in its blue grass, and the advantage of an elevation giving a cooler climate and also an abundance of springs and streams, whose sparkling waters are far better than the ponds on which the Kentucky blue grass farms have so often to depend. The cool nights in the summer season and the comparative freedom from the flies and other pests of the heated valleys are as much appreciated by the grazing bullock as by his owner, and counts on the scales when weighing up time comes to hand. That these are facts and not overdrawn, let the high estimation in which the cattle from these counties are held and the eagerness with which they are sought by exporters bear witness. In this favored section of our State it is only needed that the cattle men shall go on in well doing, and by free use of bulls of the best beef breeds of cattle increase their well-deserved reputation. There is, however, a large area of West Virginia that is not favored with a limestone soil and where nature places many more difficulties in our way when we are striving for a reliable cattle pasture. The soil is fertile, but will not cover with the close-knit sod that keeps down weeds and sprouts so man has to do more work. But while more difficult it can be done, and there are various kinds of grasses that will help attain the desired end. Blue grass and white clover seem to form the ideal carpet of green and flourish in most places after sufficient time is given. There is the rank and thrifty orchard grass that fights a vigorous battle with the weeds, grows early and late and all the summer through, and will fatten cattle as well as any other, even if they do prefer the others. The Randall grass grows, thrives and stays where it finds a soil to suit; and the flat-stemmed blue grass flourishes and forms a sod where the Kentucky blue grass will not grow, besides many other grasses not so well known to us, but well worth a trial. West Virginia has in the fertile valleys of the South Branch, the Ohio and its tributaries, many acres of rich soil, but cannot in comparison with its neighbors, be called a corn-growing State. It can and should be known as the nursery of good young cattle to satisfy the increasing demand for feeders from Ohio and other States, where corn can be cheaply grown. And in this call for feeders there is money to the growers of good young cattle. The breeder of the steer that in the fall, after it is two years old, should weigh twelve to fifteen hundred pounds and who can after sale put the money into his pocket to stay, is doing a safe business. He does not have to spend a large part of it to replace his steer, but can go and raise another. Nor does he take the risk of the buying feeder, who takes his chances on the future market. As with all the branches of farming, cattle breeding and handling has its ups and downs, but the land owner, who covers his hills and valleys with a good sod of grass that will support his flocks and herds, is engaging in an enviable occupation compared with those who plow and sow, but know not what they will reap.

# THE MARKETING OF WEST VIRGINIA LAMBS.

By Prof. Horace Atwood, West Virginia Experiment Station, Morgantown.

During the decade ending January 1st, 1900, the average selling price per hundred pounds, of choice lambs in the Pittsburg market has been as follows:

January $5.67, February $5.74, March $5.91, April $5.88, May $5.66, June $5.13, July $5.56, August $5.29, September $5.24, October $5.09, November $5.01, December $5.27.

These prices represent the average of the highest weekly quotations, in a wholesale way, of choice lambs as quoted in the National Stockman and Farmer. The season for the marketing of lambs begins with July and continues until the next July, and in this article no notice is taken of "spring lambs" for which there is a limited demand at special prices.

As the period covered by these averages is the past ten years, we may assume that the figures represent with a fair degree of accuracy, the general tenor of the lamb market. Let us therefore examine these figures carefully.

It is to be observed in the first place that the banner month for the marketing of lambs is March, and that from the maximum of $5.91 the price diminishes in both directions with considerable regularity, reaching the bottom mark in November whose average is almost one cent per pound lower than that of March. Comparing the average price for the first four months of the year, January, February, March and April, which is $5.80, with the average for the last four months of the year, which is $5.15, it is seen that there is a difference of 65 cents per hundred pounds in favor of holding lambs until after the first of January.

Although definite statistics are not at hand showing the relative proportion of West Virginia lambs which are marketed in the fall, yet it is well known that this is a common practice over a large part of the State, and, quoting from bulletin 61 of the West Virginia Station, although this is undoubtedly the simplest way of disposing of the surplus lambs, yet this practice possesses some serious defects, for when animals of any kind are constantly being sold from a farm, with now and then some hay and grain, the fertility of the soil is continually carried away, and unless commercial fertilizers are employed to supply the deficiency of potash and phosphoric acid, the productiveness of the land must constantly diminish. On the other hand, if these lambs can be profitably fattened during the winter, they may be made to consume the clover hay, or other coarse fodder of the farm which has only a small commercial value. Also the farmer is enabled to feed his grain at home instead of being obliged to draw it several miles to the railroad station. In addition to the grain which is raised upon the farm, some of the concentrated feeding stuffs, such as cotton seed meal, linseed meal, or wheat bran, can generally be used to advantage in the fattening ration, and as each of these materials contains a large quantity of nitrogen, potash, and phosphoric acid, which is recovered in the manure, it is seen that when the policy of feeding the lambs during the winter is intelligently carried out, the land will gradually become richer instead of poorer, because more fertility will be added by the manure than is carried away by the lamb crop.

We have already seen that during the past ten years fat lambs in the Pittsburg market have sold for 65 cents more per hundred pounds in late winter than in the fall. The question now arises can the increased gain in live weight produced during the fattening period be obtained also at a profit. If so there will be a twofold profit in holding lambs and fattening them during the early months of winter, a gain in the price per pound, and a gain from the added weight.

It has been found at the West Virginia Station and elsewhere that it it costs from $3.50 to $4.50 to produce one hundred pounds increase in live weight. In one experiment recorded in bulletin 61 of the West Virginia Station in which the clover hay consumed was valued at $4.50 per ton, and the corn at 40 cents per bushel, the cost of one hundred pounds increase was $3.70 and in another experiment in which linseed meal, hominy feed, and wheat bran were employed instead of corn the cost per hundred pounds increase was $4.90. It is seen that the cost was in both instances considerably lower than the average selling price in Pittsburg for the late winter or early spring months.

The fattening of lambs for winter trade is surely worthy of the careful consideration of West Virginia farmers. To be successful, of course, certain things are necessary, well bred growthy lambs, a good roof to protect them from the wet during the fattening period, palatable forage, preferably clover or cowpea hay, a suitable grain ration, and finally good judgment in feeding, for it is still true that "The eye of the shepherd fattens his flock."

An almost ideally perfect ration is cowpea hay and shelled corn. Cowpea hay is richer in protein than clover hay, and when used in connection with corn makes an almost perfect combination. The fattening period during which the lambs are on a full grain ration should continue for fifty or sixty days, depending somewhat upon the condition of the lambs and the lamb market. During this time they should gain from 15 to 20 poundseach in weight, and when sold should give the farmer at least $1.00 clear profit besides the manure.

Summing up this matter we may say that West Virginia farmers can use their coarse fodder and grain at home with profit, and save the expense of drawing the produce to market, besides, leguminous crops for which there is no adequate market value, can be grown in large quantities and fed to the lambs to good advantage. There will then be a profit from fattening the lambs, and the soil will become more fertile on account of the leguminous crops aud the increased supply of manure.

# SHEEP FEEDING.

BY JOHN A. CRAIG, PROFESSOR OF ANIMAL HUSBANDRY IN THE UNIVERSITY OF WISCONSIN.

In feeding all classes of sheep there are general details that contribute toward satisfactory results. Among these may be included all those things that are conducive to the general health of the sheep, such as considerate treatment, cleanliness of troughs and racks, healthfullness of the quarters in which the sheep are kept, regularity in feeding, and the use of such accessories as salt, pure water and sulphur.

## FEEDING BREEDING EWES.

To enter into detailed discussion of the feeding of breeding ewes it will be best to divide the topic according to the season, and in this way present the subject of winter, spring, summer, and fall feeding. Under climatic conditions permitting the breeding flocks to have pasture throughout the year, what may be termed summer feeding would largely prevail at all times, so with such an understanding local conditions will not necessitate much variation from the course of feeding suggested.

## WINTER FEEDING OF BREEDING EWES.

Breeding ewes require 10 to 15 square feet of space in a building, and ewes weighing from 150 to 200 pounds should have an allowance of 1.5 feet at the feeding rack. Less than this causes too much crowding at feeding time, which often results in the birth of dead lambs.

Breeding ewes need not be fed more than twice daily. It is a good practice, however, to feed them some fodder outside during the winter season, for in this way they are induced to take some exercise. With this in view the fodder may be taken some distance from the building in which the sheep are housed.

In a practical way, the shepherd should regulate the quantity of food according to the condition of the ewes. If they have gone into winter quarters in thin condition, they should be fed more heavily than if they were fat at that time. Handling the ewes at intervals furnishes the best indication as to their condition, and this will indicate the quantity of food that should be fed. In the author's experience the aim has always been to keep the breeding flocks in a condition which the general farmer would term "fat," and only good results in lambs have come from this management. When ewes are firm fleshed, through abundant feed and exercise, they are vigorous, and a healthy flock of lambs is like to be the outcome. In general, a breeding ewe weighing 150 pounds requires daily about one-half pound of such grain as bran and oats, 2 pounds of succulent food, and the same weight of such dry fodders as clover hay or cut corn fodder. As lambing time approaches, twice this amount of grain will be required. The quality of the fodder and grain will have an influence on the amounts to be fed, but the controlling factor should be the condition of the ewes. Overfeeding, especially if associated with lack of exercise, will be productive of disease in the flock, and it is likely to result in the birth of large, weak lambs, while underfeeding is equally favorable for disease and the birth of undersized lambs. Overfeeding may produce sterility, while underfeeding delays the breeding season. The vigorous, firm-fleshed condition which results from liberal feeding and unlimited exercise is the aim of the experienced flock master.

*Coarse Fodders.*—Among the fodders for winter feeding may be mentioned clover hay, pea straw, corn fodder, oat hay, oat straw, and millet. As to their relative merits; based on cost, the nourishment in them for sheep and more especially the preference of the sheep for them are about in the order given.

At the Wisconsin Station 6 lots of Shropshire breeding ewes, with 4 ewes in each lot, were fed one-half pound of bran or oats and from 2.5 to 3.1 pounds of succulent food per head daily. In addition to this each lot received its distinctive coarse fodder, consisting of either alsike clover hay, corn fodder cut into inch lengths, cut or uncut oat hay, oat straw, or blue grass hay. The sheep were very fond of the fine, well-cured alsike clover hay, and left only 16 per cent. as refuse. Each ewe ate daily 2 pounds of alsike clover, 2.8 pounds of corn silage with 0.5 pound of oats and bran daily, which at the customary prices cost 1.5 cents. The ewes averaged 177.2 pounds in weight at the beginning, and 196.2 pounds at the end of the experiment.

The ewes on the cut corn fodder (ears removed) ate 1.75 pounds of corn fodder, 3.1 pounds of sugar beets, and 0.5 pound of oats or bran daily, costing 1 cent. Their weight at the beginning averaged 152.4 pounds and at the end 163 pounds. The refuse, consisting mostly of the thick parts of the stalks, was 20 per cent. We have fed corn fodder extensively, and the sheep seem to like it and thrive well on it.

The ewes on uncut oat hay ate 2.1 pounds of the hay, 2.5 pounds of corn silage, and 0.5 pound oats or bran, costing 1.2 cents.

They averaged 175.6 pounds in weight at the beginning and 194.7 pounds at the end. The refuse was 32 per cent. The lot receiving the cut oat hay ate 1.5 pounds cut oat hay, 2.4 pounds of corn silage, and 0.5 pound oats or bran, costing 1.2 cents. They averaged 177.3 pounds at the beginning and 182 pounds at the end of the trial. The refuse amounted to 35 per cent. No advantage was gained by cutting the oat hay, and one of the objections to it was that the small pieces of straw would get into the neck wool, cause it to mat and, in some instances, drop away. The oats were cut when green, the kernel being just filled.

The lot on oat straw ate 1.1 pounds of this daily, together with 3.1 pounds of sugar beets, and 0.5 pounds of oats or bran, costing 0.8 cent. They averaged 155.5 pounds at the beginning and 156.5 pounds at the end of the experiment. The refuse was 22 per cent. When supplemented with the proper amount of grain and succulent food, oat straw may be utilized for maintaining breeding ewes, but it is best to have other fodder to feed at intervals.

The ewes receiving blue grass hay ate 1.5 pounds of the hay, 3.1 pounds of sugar beets, and 0.5 pound of oats or bran, costing 1.3 cents. They averaged 148.2 pounds in weight at the beginning and 153 pounds at the end of the trial. The refuse was 6.2 per cent. The sheep apparently were not fond of this hay, although the grass is eagerly eaten as it grows in the pasture.

Pea straw is greatly relished by sheep, and in nutritive value it leads all the other fodders mentioned, with the exception of the clover. In Canada, where the pea crop is a general one, the straw is put away especially for the sheep, and it is fed more extensively, perhaps, than any other fodder, with good results.

The hardness of the stems of timothy hay seems to be one of the reasons why sheep do not care much for this fodder. They never appear to be eager for it, and if given any latitude in choice they will leave it untouched in favor of any of the other fodders, with the possible exception of oat straw.

*Grains.*—For the best results in thrift, wool growth, and lamb production, the breeding ewes should get some grain during the winter season. They can hardly be kept in proper condition otherwise. A good plan is to feed oats the first part of the winter, and then bran as lambing time approaches. About 0.5 pound of oats during the first of the winter and near lambing time 1 pound of bran per head daily will be sufficient for breeding ewes weighing from 150 to 200 pounds. These are the two most satisfactory grain foods that are generally available, both in respect to cost and results. Corn is not a satisfactory grain to feed ewes, as it produces too much fat, which apparently tends to accumulate internally and impair the breeding qualities and lessen the general vigor, instead of imparting tone to the system.

*Succulent Foods.*—Some succulent food should be fed to breeding ewes at all times, though it is very easy to feed them too much just previous to lambing. When turnips or silage are fed to breeding ewes in too liberal quantities, weak lambs are likely to result. Before lambing, 3 pounds of any succulent food, such as mangel-wurzels, sugar beets, corn or clover silage will be found sufficient. After lambing unlimited quantities of these may be fed, to stimulate the milk flow.

Turnips are relished by the sheep, and the author prefers them for sheep feeding to any other roots. Sheep are very fond of any of the varieties of Swedish turnips, and also relish mangel-wurzels near springtime. Sugar beets are satisfactory if fed in small quantities. In our trials we have found that a ewe would eat daily 3.3 pounds of sugar beets, with 1.5 pounds of hay and 0.5 pound of oats or bran, costing about 1.3 cents. The ewes that were fed this ration averaged from 150 to 160 ponnds.

Corn or clover silage, when well preserved, is a succulent food that may be fed to sheep with satisfactory results. It is cheap, is liked by the sheep, and if fed in quantities not exceeding 3 or 4 pounds per head daily it will give satisfaction. The corn kernels in the silage are one of the drawbacks to feeding it liberally. In our trial with corn silage it was found that ewes weighing about 150 pounds ate daily 2.2 pounds of the silage, 1.5 pounds of hay, and 0.5 pound of oats or bran, costing 1.1 cents. Ewes of similar weight receiving clover silage ate 2.6 pounds clover silage, 1.5 pounds hay, and 0.5 pound of oats or bran, costing 1.2 cents. They gained more on the clover silage. The refuse from the corn silage was 6 per cent. of all that was fed, and from the clover silage nearly 13 per cent.

As to the relative effects of silage and roots on the milk flow, the experiments at the Wisconsin Station were without very decided results. At the New York Cornell Station this feature was studied more fully. As between mangel-wurzels and corn silage, the lambs sucking the ewes fed roots made slightly better gains than those sucking ewes fed silage, although the silage appeared to be the cheaper ration. As between beets and corn silage, the lambs of the ewes fed silage made slightly the larger gain in weight. These results show but a meager difference in the feeding value of these foods.

## SPRING FEEDING OF BREEDING EWES.

If the ewes lamb before the conditions are such that they may be turned out to pasture, they will require liberal feeding, which means about 1 to 1.5 pounds of bran, 2 pounds of hay, and so much succulent food as they will eat. It is very desirable to maintain a heavy flow of milk, and to do this grain feeding and the free use of succulent food are necessary while the sheep remain in the sheds.

*Pastorage.*—It is generally good management to turn the ewes and lambs out to pasture as soon as possible, provided some grain is fed to the ewes while the grass is in a very succulent state. There is not sufficient nourishment in it at this time to properly support the ewes that are suckling lambs.

It is advisable to so stock the pastures with sheep that none of the grass may grow too coarse. On the other hand, overstocking injures the pasture and makes the conditions favorable for diseases. Frequent change from one pasture to another will be found advisable.

*Feeding Grain to Ewes on Pasture.*—When the pasture ceases to consist altogether of a fresh growth peculiar to an early spring, there is no advantage in feeding the ewes grain. In our experience with 40 ewes and 56 lambs it was found that the lambs did not make any greater gain when their dams were fed grain on good pasture. The only compensation for feeding grain to the ewes was in the fact that those receiving grain did not lose as much in flesh as the others. But this greater loss was easily made good again when the ewes were put on rape or pasture after the lambs were weaned.

### SUMMER FEEDING OF BREEDING EWES.

In the summer management of the breeding flock there is nothing of more importance than a provision of some green fodder to supplement the dry and parched pastures that are common in most sections in the summer months. For this purpose the crops most commonly utilized are rape, rye, corn, and vetches.

*Rape.*—This crop is one that has many advantages for summer feeding breeding ewes It grows rapidly, produces a large quantity of succulent food, and is greatly relished by sheep. About two months is required for the growth of a crop. It remains fresh in the field for over a month under usual conditions after the first cutting has been made. At the Wisconsin Station 62 ewes, 26 ewe lambs, and 5 rams were fed from 300 to 350 pounds of rape daily throughout the drought of August and September. From August 16 until September 17, 9.75 tons by actual weight were cut from 0.5 acre, or at a rate of 19.5 tons per acre.

In cutting rape at different heights, the best results were obtained from cutting about four inches from the ground. Two cuttings were made from the piece so treated, one August 29 and the other November 6, and the yield was at the rate of 36 tons per acre.

*Rye.*—The writer has known a rye pasture to be in good condition after being used six years for pasturing sheep. The rye was never allowed to grow beyond the second joint of the stalk. If the sheep did not keep it down, it was cut. It furnished unusually early pasturage for sheep, and was at all times acceptable. Rye grows quickly, will establish itself in poor soil, and is eagerly eaten by sheep if it is not allowed to become rank. It may be used as a soiling crop at any time, but with special advantage if sown in the corn at the last cultivation, so as to be ready in the spring before the pastures are in condition to turn the sheep on them.

*Vetches.*—These are not as indifferent to climatic conditions as the crops previously mentioned, but where they can be grown they are invaluable for soiling sheep. They are very nutritious, and sheep thoroughly relish them. Mixed with one-third oats, with the object of supplying supports for vines, they can hardly be surpassed as a soiling crop. In the drier sections, where the need of soiling crops is greater, the vetches can not be made to produce the amount of fodder that rape does.

*Feeding ewes after weaning the lambs.*—When the lambs have been taken away from the ewes, the latter should be put on scanty pasture or given the range of a field of grain stubble, to dry up the milk as soon as possible. The ewes, if they have done well by their lambs, will be in poor condition at this time, but it it is not advisable to give them full feed.

### FALL FEEDING OF BREEDING EWES.

It is the general impression among shepherds that the condition of the ewes at the time of breeding has a marked influence on the succeeding crop of lambs. If the ewes are in vigorous condition and improving in flesh, the prospects are thought to be favorable for the production of a large percentage of lambs. It is equally accepted that the condition of the ewes in the fall prior to going into winter quarters has an effect on the susceptibility of the flock to such diseases as are more or less prevalent during the winter season. It is certain that the ewes may be gotten into vigorous condition much more cheaply and easily in the the early fall than at any time later, and it is equally true that a vigorous condition is the best preventive of disease.

*Grain.*—As the breeding season approaches (it usually begins in October), the ewes, being in thin condition, require some grain. The best grain for this time is clean sound oats, about 0.5 pound per head daily. If the ewes are brought into a uniformly good condition by grain feeding they will breed uniformly, which of itself is an appreciable advantage. During the past season, out of the flock of 55 breeding ewes at the Wisconsin Station, 52 lambed in the month of March, and this was due chiefly to the uniformity in the condition of the ewes, brought about by rape feeding.

*Fall pasturage.*—It is advisable to keep some fresh pasturage for late fall feeding. Exercise in the fall is conductive to thrift in winter and healthy lambs in the spring. In our northern climate sheep are housed too much at best. The ewes may obtain more food than would be supposed from a field of fresh blue-grass pasture that has been in part retained for them.

It is becoming an opinion among shepherds that when ewes are fed on clover aftermath they are more difficult to get with lamb than if fed on other pasture or fed soiling crops. In addition there is danger that the sheep may bloat on it. The best plan is to save the second crop clover for the lambs that have been weaned; and to prevent bloating pasture them for a part of the day on blue-grass pasture, and after they have satisfied their appetites to some extent, to change them to the clover.

### FEEDING LAMBS INTENDED FOR BREEDING PURPOSES.

When the ewe has lambed, if the lamb after becoming dry is not able to obtain the ewe's milk of its own accord, it should be assisted in doing so. Some of the milk should be drawn from the udder to see that the milk escapes freely, and then the lamb held so that it may reach the teat. If it is too weak to stand, the ewe may be thrown, but it is perhaps better to draw some of the milk from the udder and feed it to the lamb from a spoon. By feeding a teaspoonful every hour for a half day or so, most weak lambs soon become strong enough to get to the teat themselves. It should be seen that there is no dirty wool around the udder or any filth about the teats to prevent the lamb from sucking. In case of young ewes it is especially necessary that attention be paid to these matters. It is advisable to keep the ewe and her lamb in a pen by themselves for at least three days.

For feeding lambs to be used for breeding purposes preference should be given to bran, oats, and linseed meal. These are preferable to corn meal, which tends to fatten and does not produce growth to the same extent as the other foods. The bran is relished by the lambs, and they may eat large quantities of it without danger or detriment of any kind. Linseed meal is best fed in a mixture with the bran, as it is very rich and concentrated. Oats are seemingly liked by the lambs, but they will not eat them as freely as the other foods mentioned. If the oats are ground, the lambs leave a considerable quantity of the chaff untouched. The best results will likely be obtained by giving an equal mixture by weight of bran, oats, and linseed meal.

At first the lambs will take only small quantities of grain. By feeding them very little at a time and always taking away what they may leave they soon begin to eat eagerly and look forward to feeding time. To give young lambs all they have capacity for requires frequent feeding in small quantities. When the lambs are yet in the shed and not on pasture, our practice in feeding has been about as follows: In the morning about 6 o'clock they are fed a small quantity of grain, in the trough. After the other sheep are fed, if the lambs have eaten their grain more is put in the trough. At noon they receive another allowance. In the evening they are fed twice in the same manner as in the morning, and they are left at night with some grain in their troughs.

When the lambs are about 8 weeks old, they will eat about 0.17 pound of grain per head daily; when 10 weeks old, about 0.25 pound, and when 12 weeks old, about 0.5 pound.

*Hand-feeding Lambs.*—In rearing lambs that have lost their mothers, or when the latter do not give enough milk to nourish the lambs properly, it is best to feed cow's milk from a bottle that has a small rubber nipple attached to it. A newly dropped lamb only requires two teaspoonfuls at a time given every hour. It has not been found necessary to sweeten the milk with sugar or dilute it with water, but it is strongly recommended to heat the milk and feed it at a temperature of 100° F. The lambs seem to like it hot, and they certainly thrive better upon it. It is necessary to keep the nipple, the bottle, and the vessel in which the milk is heated thoroughly free from any disagreeable taste or odor, such as that of sour milk, else the lambs will refuse the milk. When the lambs are about two months old they are able to take in two feeds two pints per head daily, in addition to such grain and grass as they may eat.

*Feeding After Weaning.*—The time for weaning the lambs depends greatly upon the extent to which the lambs are obtaining milk from the ewes. When they are four months old they may usually be weaned with advantage. If they have been fed grain previous to weaning they will not be checked in their growth by it and they will be almost unconscious of the weaning; but if they have not received grain they will lose in weight and be checked in their growth.

It will be advisable to separate the ewe lambs from the ram and wether lambs. If allowed to run together the ram lambs will annoy the others and the gains will not be satisfactory. The wether and the ewe lambs may be kept together.

After weaning, the lambs should be gradually made to rely on oats as their grain ration. If on pasture of only ordinary quality, 0.5 pound of oats daily may be fed if needed, but if on good aftermath clover or bluegrass pasture less will be required.

When the lambs have just been weaned they should get the best pasture obtainable, and if possible the field should be some distance from the ewes. There is nothing better for lambs just weaned than second-growth clover that has grown up a few inches and has lost some of the freshness characteristic of new growth. There is not much danger of lambs of this age bloating on such food. Rape is an excellent food for the ram lambs, and if managed with judgment there is no danger in giving them free range. If neither of these can be secured for the lambs, they should at least have a clean piece of blue-grass pasture that has not been eaten down by other stock.

The best practice among shepherds giving closs attention to to the growth of their lambs is to sow rye in the fall for early food in the spring for the ewes and lambs, followed by vetch and oats and by vetch sown alone at intervals of two weeks. These last until the lambs are weaned and the clover aftermath is ready for them. Succeeding this comes the rape crop and fall turnips.

*Feeding During Winter.*—During the first winter the ewe and ram lambs should receive special care. The aim should be to encourage growth as much as possible by good feeding without making them fat. Some grain, preferably oats, and wholesome fodders, such as clover hay, cut corn fodder, and others that they relish, should be fed. Until they become matured the ewe and ram lambs should be fed liberally, for any loss in growth that they may suffer through scrimped or neglected feeding can never be regained in later life.

# THE APPLE IN WEST VIRGINIA.

BY L. P. MILLER, LEVELS, W. VA.

In writing about apple growing in West Virginia, the writer lays claim to personal experience only in the Eastern Pan-Handle, comprising the counties of Berkeley, Jefferson, Morgan and Hampshire, in each of which counties, he is interested in orchards. Experience in apple growing in this section of the State since it includes all varieties of soil from the famous Cumberland Valley, to the strictly mountainous districts, should give us fairly reliable data for a general statement of apple growing over the entire State.

So much has been written on theories and principles of fruit growing as though specific directions could be laid down to cover all the variations in the conditions which confront the individual planter, that we certainly hope no one will accept the statements made in this article as general principles applicable to the entire State, but only as a partial report of what has actually been done in apple growing in the State.

While West Virginia holds an enviable position among her sister States both in developed and undeveloped mining and manufacturing interests, she has unequaled resources as a fruit growing State.

The fact that apples from two different orchards in Berkeley Co., this year won recognition and prizes at the Paris Exposition, shows that there is no lack in ability to produce apples of high quality. York Imperial and Ben Davis from the vicinity of the writer, and also a few from nearby counties of Virginia have been classed separately in New York market reports and in spring of '98–'98–1900 sold at 25c to 50c. more per barrel than any other apples in the market.

For the last six years, this part, at least of the State has been growing large crops of apples every other year, producing heavily when the other great apple districts were failures, thus giving the growers a most excellent price for their apples in these off years.

An orchard of thirty-four acres adjoining the writers' home, consisting of York Imperial and Ben Davis, now about twenty-five years old, produced in the fall of '95, 6,800 barrels, selling at $1.25 per bbl. in fall of '97 over 7,000 bbls. selling at $2.43 per bbl. and in fall of '99 about 7,600 bbls. selling at $1.75 per bbl. In each crop the owner of this orchard picked, packed, and delivered the apples to the R. R. station, furnishing the barrels.

It will readily be seen that the net returns from some of these crops on this orchard were several hundred dollars per acre. This orchard has had the best of personal care by a competent orchardist, who stinted neither cultivation, fertilizer or time.

We have personally assisted in the packing of a block of York Imperial, where high as sixteen barrels of apples were picked from a single tree, not including the culls, refused according to contract by the buyer.

Nearness to the Atlantic seaboard cities puts us in excellent position to cater to the export trade, which demands the best grade of apples, honestly packed and promptly delivered so that the fruit may be in satisfactory condition on arrival.

After the sale of all large crops, and even on all farm or home orchards, there are a great many small and otherwise inferior apples which usually find ready sale at fair prices in the mining and manufacturing towns in the State, or in like localities of Pennsylvania. These few facts are introduced to show what can be done under good conditions, and why the people of our State should be interested in the development of its apple growing possibilities.

While writing of apple growing in the State with optimistic view yet we would not forget that such general crops as that of '96 will occur at infrequent intervals when the very best grades of apples sell at such low prices as to place the apple grower on the same basis of profits with the farmer growing wheat at 60c. per bushel. But such extremely large crops do not often occur and even when they do come are valuable from the fact that people in cities in this country, and in England and on the Continent who were accustomed to look upon apples as a luxury to be sparingly indulged in, came on account of their cheapness to regard them as a necessity, and so the demand becomes more general, and the market more capable of handling the ordinary crops at good prices.

Ten or fifteen years ago the generality of farmers chose as a site for their home orchard the rockiest and most generally unproductive field on the farm, on the old principle, that if the field was not good for anything else it must be good for orchard purposes.

Many apple growers of this section are now carefully selecting the best of their land for apples, finding that the first cost of land is insignificant, after considering the length of life of a well cared for orchard, the cost of growing and cultivating, and the resultant profits.

Our growers have found that in order to secure good crops and the high color which has for the last few years been so marked a characteristic of West Virginia apples, they must keep up out of the low flat valley land in which it is so easy to grow a large tree, and plant hereafter on high land with good strong clay subsoil, being careful to secure a good, light top soil. Right in this section two soils are most commonly regarded as *the* apple soils—freestone, being a sandy loam with a few gray flinty stones on the surface, and soapstone. Both these soils should have good clay subsoil. An orchard that has been under the writer's care and observation for ten years, in which the land is one-half eastern and one-half western exposure, but of same age and general conditions as to cultivation and fertilization, has shown all the time much greater productivity on the east than on the west slope.

The same is unquestionably true of most all the other orchards now in bearing in the Eastern Panhandle, so that land well adapted to apple, with sufficient elevation and eastern exposure, is commanding extra prices for orchard purposes.

An interesting point in connection with differences of elevation should be noted here. Apples, such as Grimes Golden, Winter Queen and Jonathan, which are late fall apples in the low hill land in Berkeley county, when planted at an elevation of 1,400 feet, in Hampshire county, show great improvement in keeping qualities.

It is not unusual to eat the above-named varieties in February and early March when grown in the mountains, when if raised in the valley they would be gone by Christmas. The same difference in keeping quality was noticed with Kieffer pears.

The distance apart for planting apple trees has changed a great deal in the light of some recent and very conspicuous examples.

Those who planted twenty-five years ago on good land at 28 by 36 ft. apart each way, are now planting their new orchards at 40 ft. for varieties of such habits of growth as Ben Davis and York Imperial. We have especially in mind one orchard of about twelve acres, 36 feet apart each way, in which such varieties as Vandever and Roxbury Russets have met each other between rows and interlaced their limbs about four ft. Of course these trees could not be cultivated, and as the land is strong soapstone with good clay subsoil, the blue grass sod under the trees is as perfect and as beautiful as any lawn.

But the owner reports the vitality of trees as weakening, owing as he thinks to the sapping of the moisture and nourishment from the soil by the grass, which he is unable to root out.

About the oldest large orchard in the eastern end of the State contains a block of the Nero apple, planted 36 by 36 ft., through which no spray wagon or other wheeled vehicle can pass, on account of the interlacing of the limbs, necessitating the carrying of all apples to the outside of the block before packing.

We could cite many other instances of too close planting, but the above will serve as a warning to those about to plant, not to plant very rich valley land closer than 40 ft. for spreading trees, while lighter and poorer soils and trees which are of erect habits of growth may be planted much closer, say 28 to 36 ft. Trees of erect habits of growth, like Tetofsky or Yellow Transparent might on thin land be planted even 25 ft. each way.

Much has been said and written about the relative value of budded and root grafted trees, into arguing this question we do not propose to enter and shall dismiss it by saying that a careful review of the nearby old orchards shows that the budded trees are ageing less rapidly than the root grafted trees. Budded trees are apparently less liable to get the woolly aphis, not rooting out so near the surface of the ground.

Almost all those who have planted apples in the last five years in this section have, as far as they were able to secure them, planted budded trees.

Very many planters are now using one year budded trees of short heavy grade, preferring these to two year apple trees, as there are usually plenty of body buds so that the tree can be headed any height from the ground desired.

But little time is lost by using a one year tree, instead of a two year, as the root system is not generally so much damaged by digging up out of the nursery row as in case of two year trees.

We have for five or six years carefully kept up with the various inventions and improvements in spraying methods and apparatus, and now have and use three times a year the largest spraying outfit we could buy. We yet find much to learn about spraying in order to get a uniformly good result. General experience of parties practicing spraying in the State leads them to believe that it is a necessity to successful apple growing, and at same time much work should be carefully done in this line by our State Experiment Station to bring the spraying, whether for insects or fungus growth, to a more definite and reliable point of development.

The custom of plowing around the trees with barshare about four rounds to the row, keeping a strip of sod between the trees in young orchards is gaining favor among all the orchardists.

The old way was to plow all the ground up and plant corn or potatoes between the trees, and in this way cultivate the orchard during its early years by cultivating other crops.

A new era seems to be at hand in the matter of growing young orchards. Instead of robbing the soil of its strength by taking crops off, the custom is becoming very general to sow such crops as Cow peas. Crimson clover, (which does not do well with us) Soja beans, and last and handiest of all, Red Clover, which may remain for several years as a permanent strip of sod, while the apple trees are young.

For the first few years the trees are most commonly plowed with shovel plows at least five or six times per season, four or five feet from the trees, plowing both ways. The Cow pea is rapidly gaining favor for use in bearing orchards as they may be sowed in off years when there is no crop of apples, and plowed under either in the fall or left till spring and plowed under with the first cultivation. When the older orchards have set a full crop, a distinct effort is made to keep down every weed by double shovelling the entire ground both ways, and then keeping the Springtooth harrows on the go to conserve the surface moisture.

One of the first and most important problems to solve when planting apple in any locality is just what varieties to plant. There are usually a great many varieties which do fairly well, but only a few that do fulfill all the requirements and do excellently. The writer's father has been experimenting in apple growing for just about fifty years, and has been compelled to discard many varieties, retaining as permanent acquisitions only those few that have done well for us and for the other growers of this section,

In choosing varieties for planting consider whether you are planting for local trade in nearby towns or city trade, to which apples will have to be shipped. A man does not live long enough to plant and get the good from very many apple orchards, and the greatest care should be used in selecting varieties adapted to the locality and for the purpose they are raised. The following varieties are not recommended to any one to be planted. but we simply report that this list has done well in the counties of Hampshire, Morgan and Berkeley under varying conditions of soil and elevation, and should do well throughout the State.

For Summer Varieties—Yellow Transparent, Star, Williams Favorite, Red Astrachan, Early Harvest, Tetofsky, Sweet Bough, Lowell, and for home use should be added Primate and Penoni.

Fall Varieties—Maidens Blush, Twenty Ounce and Gravenstein.

Winter Varieties—York Imperial, Ben Davis and Grimes Golden. These three varieties far outrank all others as money makers for winter use and are planted more at present than any other varieties in the eastern end of the State. The York Imperial and Ben Davis from Berkeley county have been shipped direct from the orchards to the European markets. These varieties are not altogether satisfactory, although they are so well adapted to most of the conditions. The York Imperial turns brown or scalds in January or February, and the Grimes Golden is a little too much of a fall apple, seldom keeping later than January.

Other old varieties not so prominent and not so largely planted, but which do well in the State, are Stark, Salome, Newtown Pippin, Jonathan and Langford Seedling.

We have now several new winter varieties under trial, some of them having borne two or three crops. From these we may secure one or two varieties which will more exactly suit our State than any yet generally planted. These varieties are: Northwestern Greening, Babbitt, Loy, Gano, Carlo Sweet, Aiken, Black Twig, Spring Dale, Black Arkansas. Of these last four varieties we still have a few specimens left at this date, July 20th. They were kept in *cool* storage. In previous years we have kept the North Western Greening in same storage until June with only a small per cent of waste. From these apples we may secure a variety after thorough testing which will be much more profitable to West Virginia growers than any yet tried.

Apple picking has attractions for most men similar to the hop picking season of northern New York and the bark peeling season of our own State.

For the last three crops the writer's father has built sleeping bunks in an unused cool storage apple-house, and in another out building, and with a man cook and an assistant has boarded forty to fifty men in harvesting his crop. The men enjoy camping together and are sorry when the apple harvest is over.

Much more rapid picking has been reported from other states than has been done in West Virginia. Generally speaking it is hard to get more than sixty-five bushels picked per day for each man, picking large trees and using stands and ladders.

Some are packing on tables, having the apples brought from the trees, and poured from the pickers' sacks right on the packing table, which is made 7 by 5 ft. with a 7 inch board edged up around the margin and a slat bottom to let the leaves and twigs fall through. A crew of six men at the table and three other men pack out about 200 bbls. per day, nailing, double-facing, and headlining the barrels. Formerly the apples were picked and piled on the ground, in the shade at the root of the tree, packing them after the picking was completed. This allowed the apples to sweat and toughen, which was thought to materially better the keeping qualities of the apples, but after the test of packing the apples in the season of 1899, from tables, and putting them immediately in cold storage in New York, the storage men reported the apples packed from table and placed in cold storage as soon as possible, showed up 20 per cent better in the spring than those of same variety piled on the ground before being packed.

The selling of apple crops where from 5 to 10 thousand barrels are to be disposed of, becomes as the fall season comes on a most interesting and exciting task.

Buyers prefer to buy large quantities in a single neighborhood, by so doing one representative of the buyer can superintend the entire output of a locality, thus giving uniformity of packing and grading.

Apple buyers cannot afford to send a high salaried representative to pack out a few hundred barrels, in a place, so that where the lots are small, growers must expect to get less for their apples than where large crops are grown.

The best buyers like to buy where the varieties offered for sale are few in number. A great number of varieties make trouble in keeping them separated when placed in cold storage.

In the large apple growing district near Martinsburg, W. Va., when the apple crop is good, buyers begin coming to look at the fruit in July and August, noting carefully all the good and bad points as the crop develops and approaches maturity.

Two of the most prominent growers have now for two seasons set one special day in the middle of September for the sale of their two crops. Probable buyers, from Boston, New York, Philadelphia, Chicago and other cities were notified that the crop would be offered for sale, and invited to be present and bid on the crop.

The apples were offered for sale under certain conditions, named in a contract, specifying, as to size, blemishes, packing, delivery to the station, and any other points necessary to bind the parties, including the payment by the buyer of $500.00 cash, immediately upon purchase of the crop. This money is held by the grower as a guarantee of good faith and fair dealing on the part of the purchaser, and returned to the owner when the picking and packing season is over and the contract carried out to the letter.

The actual sale is made either by sealed bids, submitted to two disinterested parties, or by the assistance of an auctioneer. The result of the two seasons experience with this method of sale has been in the case of both growers entirely satisfactory. The buyers however prefer to buy the largest crop in a section privately, paying a fair price for them, and then buy the small crops for as little as possible.

Usually when a large buyer purchases the heaviest crop or crops in a place no other buyer can afford to place a representative there to gather up the 50 to 500 bbl. lots. So that these small growers fall an easy prey to the buyers of the large crops who have bought at a secret price and have driven out their competitors. A buyer will often pay $1.75 per bbl. for a single crop of 5000 bbls. bought privately and offer for small neighborhood lots only $1.00 per bbl. under same conditions, and the small growers not having enough to afford cold storage on their own account have simply to sell for what they can get at packing time.

One of the most important matters to be looked after before undertaking to harvest an apple crop, large or small, is the early purchase and delivery of all barrels necessary to pack the crop. Failure to take this precaution has in several cases resulted in great loss to the grower by rotting of apples in the piles under the trees, due to delay in packing, occasioned by carelessness of the grower not securing his barrels in time.

San Jose scale has appeared in only a few localities in the State, though in some of the instances the effects have been most disastrous, which should serve as a warning to every apple grower to fight this pest in every way known to those who in worse infested States have been compelled to learn sad lessons from experience in combatting this the greatest known evil to apple growing.

Concerted action should be taken to waken up our State Legislature to give us a law similar to that of Maryland, requiring fumigation of all trees raised in the State and entering from other States; also regulations governing the treatment and disposition of orchards already infested. The very life of the industry in this State depends upon the prompt action of our law-making bodies to protect us from general infection over the entire State.

The Woolly Aphis is another menace to apple orchadists. It is particularly dangerous, because working on the roots it escapes notice until the tree is in the last stages of the disease. Within the last few years the Experiment Stations have been doing a good deal of work on the Aphis, and we may expect to secure some very successful remedy as a result of their efforts in this line.

Our State Experiment Station has made a careful record of the work done in resuscitating a 40 acre orchard near Martinsburg. This orchard at the age of nine years was in an apparently dying condition from Woolly Aphis. The dirt was removed from around the upper roots, five feet from the base of the tree, and about 2½ gal. of tobacco dust was applied, and then covered up with dirt gotten at a distance from the tree. After this, several hundred bushels of lime per acre was broadcasted and the entire surface soil treated to very intense cultivation for two seasons. Trees which had small yellow leaves and refused to grow at all previous to treatment, gradually showed improvement and now after about five years the foliage is dark green and a growth of about three feet all over the trees by the end of present growing season will be noted. The proprietors of this orchard do not give the credit to the tobacco dust entirely, but think the intense cultivation, and improved condition of soil due to the lime, are as efficacious as the tobacco dust.

In recent apple plantings, some are showering in ½ gal. of tobacco dust in the tree hole, while the men are filling in the dirt around the tree thoroughly mixing the dust and dirt from bottom of hole to the top.

In closing there are several things which should be mentioned as a probable part of the business in the future.

First, is the matter of thinning. The trade is so exacting in its demands for high grade fruit that it certainly will pay at no distant date to thin off all knotty and wormy fruit once or twice during the early growing life of the apples. All knotty and wormy apples will be destroyed to keep the insects from escaping and attacking other apples. Enough of undersized good apples also should be thinned off, to leave only a moderate crop. The increased size of the individual apple will more than make up for what is pulled off. Such treatment would ensure more regular crops and better prices.

In second place, all growers will pack from tables in the orchard, thereby improving the keeping qualities of many varieties.

Again, spraying will be a much more exact science and will regularly give satisfactory results.

Such pests as San Jose scale, Woolly Aphis, and other diseases now disturbing elements will be very largely under control at least by the practical orchardist who is willing to secure exemption from these pests according to the motto: "Eternal vigilance is the price of liberty."

# HORTICULTURE IN WEST VIRGINIA.

BY HON. T. C. ATKESON.

In attempting to discuss the subject of Horticulture in West Virginia, we find ourselves confronted with magnificent distances and great possibilities with but limited realities. It is the possibilities rather than the realities that must constitute the basis of this paper. Horticulture in its restricted sense, means the art of cultivating gardens, but the word in common use, has been expanded so as to include the cultivation of all manner of small fruits, and in the minds of many, includes all kinds of fruit growing—covering the whole scope of pomology. Under this broader meaning, including both gardening and fruitgrowing, we will consider it. Owing to the nearness of this State to the larger cities and the great mining developments in many sections, market gardening is yearly on the increase, and owing to the peculiar formation of the surface of the State there is no department of agriculture that will ultimately be more profitable than that of market gardening and fruit growing. With increasing transportation facilities, Horticulture in its several departments will become a close competitor with stock raising on the narrow bottom lands along our creeks and rivers, while fruit trees will take the place of the original forest trees on our hill tops.

The climate and soil of our State are especially adapted to the production of very fine quality of apples, especially of the winter varieties, which are excellent keepers. Peaches do well in most sections, and especially on the hill tops and mountain sides. Some of the largest peach orchards in the world are in this State. Pears, plums, cherries, and berries of all kinds yield well in every county in the State, and are grown in considerable quantities. "The vine clad hills of sunny France" are scarcely more favorable to grape culture than are the hill sides of West Virginia. While grape culture and wine making have been engaged in to no great extent, the possibilities in that direction are limitless and we predict that this State will, ere many years, be one of the foremost grape-growing States in the Union. All kinds of vegetables suited to this climate grow here and our wide climatic range gives suitable seasons for all the vegetables that are grown. "Wild berries may be had for nearly six months in the year by following them from the warmer parts through cooler ones and up the mountains, where they ripen many months later than in the lower parts."

The coarser vegetables, such as cabbage, potatoes, turnips, and the like, are profitably grown in many sections of the State, and the surplus shipped to the cities. Within the last few years quite a number of canning factories have been established in the State, while preserving and catsup establishments are finding profitable locations among us. They stand ready to take, at a profitable price, all the tomatoes that can be produced, and are becoming large consumers of much of our fruit and berries. The bottom lands along the Ohio river have been noted always for their yield of Irish potatoes, and immense fortunes were made many years ago by boating them to the Southern markets. The horticultural possibilities of the State have been more fully developed, perhaps, in what is known as the Northern and Eastern Panhandles, than elsewhere. Several years ago in a public address made in Jefferson county, we stated that we were a boy and studied the geography of this State, it appeared to us, while looking at the map, that Jefferson, Berkeley and Morgan counties had been hung on to the State by the tail, but since visiting that beautiful section, we have concluded that West Virginia was hung on to those counties by the tail. The same thing applies largely to the Northern Panhandle, except that the map of the State reminds us of an immense turtle with his neck stretched out, going North, or his tail stuck out going South, In either case the Northern Pandhandle is a very important part of the State. Outside of the two Panhandles, and along the of. Ohio, Kanawha and some of the other larger vallies, but little has been done at gardening or fruit growing. The Greenbrier and Monroe section produces a great many apples which find a ready market Southward and Eastward. Barbour county is well adapted to horticulture, especially in the western part and along the Tygarts Valley river. A part of the fertile Valley of Virginia lies in Berkeley county, and the whole county seems to be exceptionally well located for profitable gardening and fruit growing, and thousands of peach and apple trees are already yielding large returns to the orchard owners. Taking the counties of the State alphabetically, we come to Boone, which is one of the most undeveloped counties in the State, but as its immense forests of timber are cleared away, which is now being rapidly done, it will be found to be one of the very best fruit counties in West Virginia. Braxton is the central county of the State, and its agricultural and horticultural resources have been considerably developed. The lands are high and rich, and well adapted to such purposes. Brooke county is included in what we have said about the Northern Panhandle. Almost the entire county is in a good state of cultivation and her horticultural interests are surpassed by but few counties in the State. Cabell county borders on the Ohio river and is traversed by the Guyandotte and is among the best agricultural counties. In the neighborhood of Huntington considerable progress has been made at gardening. Calhoun county soil is rich but little attention has been given to gardening, largely for the want of transportation facilities. Clay county is well adapted to fruit growing and with railroad connection with Charleston, gardening will doubtless become a profitable occupation. Doddridge is one of the best stock growing counties in the State, but near the B. & O. R. R., which passes through the county, gardening might be made profitable, and considerable fruit of finest quality is now produced. Fayette digs much more coal than potatoes and has so far been a much better consumer than producer of garden products. Gilmer, like Calhoun, is watered by the Little Kanawha, and has developed her horticultural possibilities but slightly. Part of the celebrated South Branch Valley lies in Grant county and some of the finest farms in the State are in that county, and there are few counties better located or adapted to successful horticultural operations. We have already referred to Greenbrier county, and under the head of agriculture, this county stands close to the top of the list of counties in the State, and with her fine limestone soil any department of horticulture could be made very profitable. In Hampshire county we again strike the South Branch Valley, and some of the best farms in the State. Here fruit culture has been considerably developed, and market gardening would find a paradise. In Hancock county vegetables of all kinds are raised to a considerable extent, the cities in close proximity creating a market for all that is grown. Hardy county is similar in many respects to Hampshire and is chiefly an agricultural county, possessing some magnificent farms. It is the best corn county in the State. As high as 166 bushels of corn per acre, having been claimed on one farm. Land that will produce such yields of corn must prove the gardener's El Dorado. Harrison is one of the best grazing counties and is especially well adapted to fruit growing, which it has developed probably as extensively as any county in the State. Jefferson is, perhaps, the most exclusively an agricultural county of any in West Virginia, and is certainly surpassed by no other. It is the nearest to the great Eastern centers of consumption, with splendid transportion facilities, which bring it within a few hours of Washington and Baltimore. Fruit culture offers vast possibilities in this county, and the most magnificent peaches are grown. Kanawha county is chiefly noted as a mineral county, although some of the finest farms in the State are found along the Kanawha Valley in this county, and peaches, apples, pears and grapes and all kinds of small fruits grow abundantly. The mining towns along the Kanawha and the city of Charleston make market gardening profitable. Lewis is a grazing county, well adapted to all departments of horticulture, but as yet but little attentention has been paid to the subject. Logan, like the chief of the Mingoes, abides mainly in the woods, and but little attention has been given to horticulture. Marion has a good limestone soil and is considerably above the average in horticultural development. Marshall is chiefly an agricultural county, with excellent soil, and lying along the Ohio river, is splendidly located for horticultural purposes and that industry has been considerably developed. Mason county with her long Ohio river front, ranks along with Jackson, as among the best agricultural counties, with a world-wide reputation for large yields of potatoes. Fruits of all kinds do well. Mercer and Lincoln counties, like most of the section west of the Kanawha, are splendid fruit counties, but little attention is paid to its cultivation. Mineral has some fine farming lands, and owing to its soil and location, it is destined to be one of our best horticultural counties. There are few counties in the State where fruits of all kinds do better than in Monongalia, and with her direct and easy communication with Pittsburg, market gardening will become an important industry. All that was said of Greenbrier may be truthfully said of Monroe county, and considerable attention has been given to fruit culture in recent years. McDowell is famous for its absence of agriculture in any form, though its recent coal developments make it a splendid market for all kinds of horticultural products. Its rich valleys may be made profitably available to supply the home demand. The rich uplands of Nicholas county are particularly suited to fruit growing, and the finest grapes and peaches are grown. Ohio is an all around good county, and about all the land in the county outside of the city is under cultivation. With her splendid local market afforded by the city of Wheeling, market gardening is probably more extensively engaged in than in any other county. Many tomatoes, cucumbers, and other vegetables are grown for the catsup, canning, pickling and preserving factories of Wheeling. Pendleton county is mostly covered with forests, but fruit tree planting is following the woodman's ax, and all kinds of fruit are found to do well. In Pocahontas county fruit raising is an important branch of agriculture, and no better fruit country can be found anywhere. Farming is the principal occupation of the people of Putnam county. The farms along the Kanawha river bottoms are among the best in the State, and the uplands have been found well adapted to fruit culture, which is rapidly on the increase. For fine fruit Raleigh county is unexcelled, but as yet, little attention has been given to agriculture. Randolph county is not an agricultural county, but like all high elevations, is well adapted to fruit growing. Ritchie is one of the best interior counties, but her people have turned their attention to grazing rather than horticultural subjects. Roane is one of our best fruit counties, and her horticultural possibilities are being developed to a considerable extent. In Summers county all kinds of fruits do well, particularly grapes, apples and berries. The high, flat mountain tops, fertile soil and cool climate are excellently adapted to fruit culture. Taylor county is well located for market gardening and is well adapted to fruit growing. Tucker county is high up on the mountain, and is destined to be one of the best fruit and berry counties in the State. Tyler, like the other counties fronting on the Ohio river, has many good farms and is well adapted to both agriculture and horticulture. Upshur county is near the center of the State, and is particularly adapted to the production of fine grapes and apples. Wayne county has a long river front along the Ohio and Big Sandy, and is developing very rapidly and owing to its convenience to good markets, every department of horticulture is found profitable. Webster county is located very near the center of the State and is chiefly noted for its fine timber. Wetzel is a good agricultural county and garden stuff is raised by many of the farmers, the nearby cities affording a good market. Wirt is a fine fruit county. Blackberries, raspberries and other berries grow wild in great abundance and more attention is probably given to her orchards than any county in the State, which produce a considerable revenue to the people of the county. The largest vineyards in the State are found in Wood county. Fruits yield well and large orchards are planted in the higher parts of the county. Wyoming is the last county in the State, alphabetically, and probably the last in her horticultural development. By far the greater part of gardening done in the State is for household consumption. Every farmer and farm laborer has his kitchen garden, which yields a considerable per cent. of the family support. If an accurate computation of the actual value of these kitchen gardens could be made the magnitude of the figures would astonish most of us. The value of these products might be greatly increased with profit, for the farmer's garden, like the feet of the blacksmith's horse or the shoemakers' wife, is notoriously neglected. But our farmers, fruit growers and gardeners, as well as our products, and our methods, are advancing and improving. Many instrumentalities are at work, silently it may be, but none the less potently, urging our farmers on toward material and intellectual advancement. The Grange has been an important factor in this advance movement, while other organizations, societies and associations have aided in the good work. This is compartively a new State, and it would be difficult to find anywhere in the country better opportunities for profitable investment in almost any branch of agriculture or horticulture. Considering the difficulties our farmers have accomplished much, and we have possibilities of which we have scarcely dreamed.

## STONE FRUITS IN WEST VIRGINIA.

BY HON. H. W. MILLER, PAW PAW, W. VA.

Stone fruits do well in West Virginia, with the exception of the apricot, which is too early in blooming to mature crops. The peach stands first and is grown quite largely for commercial purposes, especially in the eastern part of the State. Our location being central, we are enabled to reach both eastern and western markets with cheap and efficient freight service, thus giving us the advantage of good markets on either side of us. Peaches do best on our light mountain soils but also thrive well in the valleys. The best soil, however, is usually red shale or soapstone, with sand mixed. Though the peach does well on thin, and even worn-out, old lands, yet it has been found that trees planted on new ground from which no crops have been taken give so much better fruit and more of it that a great many of the larger growers are going right into the woods and clearing the land out for new orchards. Location and elevation have very much to do with successful peach-growing. Our State, by reason of its variety of altitudes, being able to grow nearly every variety of peach successfully, if planted in suitable locations, such varieties as Bilyeaus, Late October, Salway, White Heath Cling and Picquetts Late, which can not be grown at all successfully in the low lands or tidewater belt, come to their highest degree of perfection on our mountain tops and sides. These varieties have nearly all been discarded by the eastern growers, owing to their not maturing perfectly, thus leaving their season to be supplied almost exclusively by the mountain growers of our State and Maryland.

The State has a great deal of land suitable to the cultivation of peaches as yet almost untouched which can be bought at low figures and should be planted in this fruit. In the eastern end of the State the practice of thinning is carried on quite extensively and with good results. Most growers thin from six to eight inches apart on the trees.

There the peach is grown and shipped by freight in refrigerator cars. This method being for more satisfactory and cheaper than express shipping. First class cultivation is practiced by the successful growers, and with good results. Most growers cultivate bearing orchards from 4 to 6 times usually plowboth ways, then using spring tooth or cutaway harrows for leveling the surface. Trimming is usually done with a view to thinning the fruit and shaping the tree for bearing trees this usually requires cutting away about ⅓ to ½ the last seasons growth and thinning out the centers to admit light and air. In our higher altitudes mildew and rot are not much known the "leaf curl" sometimes however does considerable damage, but can be controlled by spraying with Bordeaux mixture very early in the season. It has been found best not to use a solution stronger than 1 ℔ blue stone and 1 ℔ of lime to 48 gallons of water on the peach as more than this has been known to burn the leaves off peach trees and do more damage than the "curl." In all cases our growers have found that a little excess of lime can do no harm and will in most cases relieve the operation of any danger whatever to the foliage. The greatest pest our growers have to contend with is the borer and the only successful method of dealing with it is by removing the earth from around the roots of the tree and then using a fine wire and sharp knife to take out the worms by hand. This is usually done early in May, and the trees are left open for about 10 days after which they are gone over again and as the worm is always at work they can be located the second time without unnecessary cutting of the bark from the roots of the tree.

The "San Jose" scale has also made its appearance in some parts of the State, and should be looked after most carefully, as it is known now to be the worst enemy the fruit grower can have. One year trees from the bud are usually planted by our growers though some use June buds. The latter are not usually as sure to grow as one year trees, and we do not advise their planting if older trees can be obtained. In planting, the whole root of the tree should be taken up and placed in the hole which should be large enough to admit all a tree may have without cramping in any way. It has been found that root pruning is decidedly against the tree in our State and our planters usually leave on all roots not wounded by the tree digger and trim back the top of the tree to a straight stick about 24 to 30 inches high, leaving a few side branches from 3 to 4 inches long at the top to prevent freezing from the side.

Fall and spring planting are both practiced but the fall is the best season, as more time can then be taken in planting and the trees start better in the spring. It is found by experience that some of the larger yellow varieties, including "Chairs Choice," Brandywine, Globe, Wheatland and Foster do not bear enough to be a success financially on our mountain sides. These varieties, however, grow very successfully in the valley of Virginia, near Martinsburg and Harper's Ferry.

The fellowing list of trees have been found most valuable for general planting over the State and are named about in the order of their ripening: Southern Early, Yellow St. John, Mt. Rose, Moores Favorite, Old Mixon, Stump the World, Reeves

Favorite, Elberta, Crawford's Late, Fox Seedling, Stevens R. R.; Walkers Va. free, Smock (free), Gearrys Hold-on, Ford's Late, Wonderful, Picquetts Late, Yellow Cobler, Sunrise Cling, Heath Cling, Salway Seedling, Bilyeaus, Late October. Many other new varieties are being tested, but have not shown decided advantages over those named.

It has been found unprofitable to grow any of the early varieties, for market such as Alexander, Waterloo, Amsden's June, and it is very doubtful about the Triumph, Sneed and Greensboro being of any practical value to the commercial grower, though they are very highly recommended by all nurserymen.

As has been stated some of the large yellow varieties do best on low lands, on the other hand it is found that Elberta, Old Mixon, Fur, Yellow Cobler, Picquetts Late, Salway and Bilyeau are all much more successfully grown on the mountains than anywhere else, being better colored, and of superior flavor. To be successful in a financial way our growers have found that peaches should be honestly packed with as good fruit in the bottom of the basket as on top. In all cases the grower is the loser if peaches do not arrive in the market in good order and the packages full. In order that this may be the case it is necessary to pick the peach just as soon as it will give a little on the ridge, and if for very long shipments whenever well colored. The packages should be well shaken when being filled, and the lids put on tight and secure. For the Atlantic coast cities the ⅝ Delaware basket is the most saleable package, for the inland towns the six basket carrier, the crate, or the flat-handle basket, may be used.

## THE PLUM.

The plum is being much more looked after since the introduction of the "Japan" family. Owing to the European Plums being attacked by curculio and rot in the valleys, plum culture has not received the attention it should have. A few of our enterprising growers in the eastern end of the State have found that all three families of the Plum succeed well on the mountain soils. Where sufficient elevation is reached the Japans are free from rot and the American and European varieties are not troubled to any great extent by the curculio. About the same mode of cultivation is followed in plum growing as with the peach. The Japan family of Plums are found to be nearly curculio proof and therefore do not need to be sprayed to protect against that insect.

The fruit should be sprayed, however, with Bordeaux Mixture to prevent rot, using about 4 lbs. of bluestone and 4 lbs. of lime to 40 gallons of water and spraying 3 times during the season. The most successful varieties of Japan Plums are named below in about the order of their ripening: Willard, Ogou, Red June, Abundance, Burbank, Bailey's Japan, Wicksow, Yeddo, Normand, Birckman's, Hale and Satsuma. Of this number probably the best for general purposes are Red June, Abundance and Burbank. Some of the others may be as good as the latter but should be tested more fully before planting extensively.

The American varieties have not been tested very extensively, but have one good point not possessed by the others, in that they are entirely free from black-knot, a fungous disease, very fatal to the European varieties and against which the Japan varieties are not entirely proof. The best varieties of the American type are Wild Goose, Hammer and Weaver. The European family of plums, including Lombard, Bradshaw, German Prune, Niagara, Washington, Bareys Gage, French Damson, Imperial Gage, Shropshire Damson, Lincoln, Shippers Pride and Hungarian Prune, are by far the best in quality of all the plums grown in our State and should be more largely planted than any or all of the others. Probably the best of this family for general planting are the Damsons of all varieties and also the Lincoln, Shippers Pride and Bradshaw. This type of plums are nearly all enormous bearers and are generally rot-proof if grown on high mountain land. The chief enemies are curculio, shot-hole fungous, and black-knot, all of which are very destructive if not looked after diligently. It has been found that jarring the curculio off on sheets and burning them is very successful, and also spraying with paris green is a great aid in holding the curculio in check. The shot-hole fungous, which causes the plum to defoliate about mid-season can be held in check by spraying with Bordian Mixture, if done early in the season and continued until about July 20th. The only method of controlling black-knot is to cut and burn the affected part as soon as discovered, giving the disease no quarter.

# THE PEAR.

### BY G. P. MILLER, ROMNEY, W. VA.

The pear has been showing results that are very encouraging in the last few years in the eastern end of our State, while if it is not grown to any great extent for commercial purposes, those who have tried it have been successful, where proper attention has been given and the fact that they can be grown has been fully demonstrated and established by experiment and observation.

The opinion that this fruit would give the best results when planted on heavy rich soil has been quite general, but we find that the tree and the fruit can be grown with fine results on nearly all our soils. Some very fine crops have been grown on the light sandy soils of our Mountain sections. The only two things absolutely necessary are lands that can be worked deeply and thoroughly drained, as the pear likes to root down in the sub-soil, their roots invariably run down as can be seen by the young trees when dug from the nursery rows.

The drainage is necessary for the same reason as in other fruits. The color being much better is less liable to mil-dew, the trees being healthier and less liable to blight when the land is properly drained. The height or altitude is quite a help in growing fruit of good color and quality. The fruits grown at high elevation being smoother in skin, higher in flavor, firmer in texture, and better calculated to stand shipment. The trees are also sure croppers and have less off years when planted on high land. In planting an orchard it is best to get land as near level as possible as the style of high cultivation necessary to give the best results makes steep land very apt to wash, and as pear trees live to a great age frequent washing will impoverish the land and make it impossible to keep the land in good condition even if fertilized highly, the wash being one of the greatest troubles to the orchardist in the hilly country. Great care should be exercised to prevent it as after the trees are planted once under soil cannot be brought up without injuring the root system of the trees. As pear orchards live to a great age and grow to a great size it is well to be careful to grow the trees on stocks that are as near natural as possible; all trees grow better and give the best results when grown on their own roots.

The root will affect the growth and vigor of the tree and should be as near like it as possible.

The French pear stock is giving better general results for most varieties than any other, although the Japan stock has a very quick fine growth and has been giving good results for the Kieffer and kinds mixed with Chinese varieties. As the Japan stock is a new thing it may be well to use the Chinese blood in them. The old wild thorny stock gives a flourishing growth, but sprouts from the root too freely, and has too much of a tendency to make a wilderness of the orchard. In looking over old orchards we find decaying stocks bad and imperfect junctions where they were budded or grafted. Some trees of the same variety are larger, some smaller and of a dwarfish growth.

Much of this is due to the root not being congenial to the top. The heavy bearing capacity of the Kieffer is causing a very heavy planting of that variety in this State as well as most other States of the Union. It is planted more than all other varieties together. This is likely to be a mistake and the Kieffers sold very low unless its excellent canning qualities relieve the market. It is used much by the Baltimore packers and gluts in the market may be avoided by them. The Kieffer does not stand cold storage and for that reason does not make a winter pear, nor does it aspire to the fancy prices of the winter Nellis and other better keepers. The great amount of Kieffer pears placed on the market is likely to educate the people to use more pears and thereby increasing the demand for other varieties.

The great boom in the Kieffers is likely to be a blessing to the pear growers in this way, as it will place the pear more prominently before the people and cause it to be more freely used.

While the pear is no new thing it is capable certainly of being much more used and a much more prominent place as a commercial than it now has. We notice the fruit solicitors visiting our section are much more interested in it than they were a few years ago.

This looks like it is growing in favor and the demand likely to increase. Owing to the blight and careless orcharding the pear has not been placed on the market enough for its real value to be appreciated. In selecting varieties it is well to try to get those that are sure croppers and free from blight. Free growers are not always the best as slow growers such as the Clairgeau and others give as good results as those that grow a larger tree. Most of the standard varieties have been doing well, Buerre Guifford, seems to be the best for early ripening it being a good grower and a fine tree. The Bartlett, Clapps Favorite, Howell, Seckel, Clairgeau, Anjou, Berry Boss are all excellent in their season. The Sheldon is of the finest quality but a shy bearer. The Lawrence and Winter Nellis seems to be best for winter varieties although neither of them bear as well as some other varieties. Of the newer kinds the Wilder Early promises well, it ripens early and is quite prolific coming in advance of Buerre Guifford. The next new variety is Seneca which follows the Bartletts and is a great acquisition to the summer lists it being larger than Bartlett well colored and a great bearer. The Garber makes an excellent showing, is of Kieffer strain, a week or two earlier, a great bearer and the best grower of all, better quality than the Kieffer and of the finest appearance and sure to give the planter lots of pears. The Vermont Beauty has its first crop in this section this season and make a good showing. The Lincoln is another new variety of great merit, it ripens with Howell and is a great bearer, not quite of first quality, but excellent for canning and will stand heavy planting. The Lincoln Coreless has proven a failure, the fruit being worthless. The Henry bore heavily last year and is bearing again this year it is a heavy bearer and of fine appearance, a fine keeper. some of the pears kept until March under unfavorable circumstances. It is very much like Vicar, but larger and of better quality. The Angel, Krull and the Barry are all bearing with us this season, and promise to do well. The great need of the commercial pear grower is a pear of first quality that will bear well and keep until late in the winter.

In New York last winter the Nellis and Vicars were selling from stands at ten cents apiece, such prices as this will certainly justify an effort to raise fruit to sell in the winter season. The Nellis is a fine quality but a rather light bearer and of poor appearance. The Koonce must not be forgotten, it proves to be a great bearer of fruit of Hoseschenck type and not a desirable quality. Great care should be taken to keep the trees from drying as pear trees are likely to make a poor growth the first year if allowed to dry or get stunted from careless or bad handling in transplanting. We find that the pear needs the same cultivation as any other kind of fruit which should be done early in the season and not later than August first.

Cultivation done later than this produces a weed like growth and put the trees into the winter in an unripe and tender condition. Shallow working is preferable on account of the roots, but an orchard of any kind should be worked as deep as it can be without disturbing the root system. There seems to be no specific fertilizer for the pear, but it is desirable to have a formula stronger in ammonia than the formulas generally used for peach, which contains a large proportion of potash and phosphoric acid. Pear trees like other seeded fruit do not require heavy trimming, and are frequently injured by a too free use of the knife. They should be trimmed skillfully, and just what they need each year, so that there is no accumulation of branches or material that will need removing at any one time.

Spraying has been found to be very beneficial, both in furthering the growth of the tree and in perfecting the fruit. It keeps the foliage from dropping and defeats the shot hole fungus and other things that interfere with the growth. It also destroys the fungi on the fruit which made it impossible to grow such varieties as Clairgeau, and seriously injuring the Josephine and other like varieties. As many varieties of pears overload themselves, thinning has been found to be of great benefit, as it makes the use of very many varieties, practical and profitable, that were otherwise useless. A great many varieties, such as Kieffers, Garber, Josephine, etc., are utterly worthless without being thinned, the fruit being both deficient in size and flavor. The firmness and keeping qualities of winter varieties is also much benefitted by thinning. The short or two-bushel barrel has been the most satisfactory package in the past few years. The skin of pears is very sensitive to scars and bruises, and the barrel takes better care of the fruit than any basket that has been in use yet.

# STATISTICS.

# AGRICULTURAL STATISTICS.

The statistics here given are in tabular form, requiring much less space than they otherwise would, and are much more convenient for reference. We have been enabled to gather this information mainly, through our county reporters, most of whom were very prompt to respond with such information as they were able to gather. We are also indebted to some of the county officers, who reported to us as the returns were received from the districts of their respective counties, but in many cases these were very late in coming in. The information here given can be relied upon as being full and accurate as can be well obtained under the present working system.

It is very important that the most complete and accurate statistics should be obtained, if we are to show anything like the true value of our agricultural resources.

This cannot be done without special legislation, to which reference has been made under the head of recommendations.

We wish to extend our thankful acknowledgments to all who have kindly contributed to make this report what it is.

For comparing West Virginia Statistical Report with other States, we append some of the Reports of the Statistician of the United States Department of Agriculture.

## TABLE I.

### *Showing the Number and Assessed Value of Farm Animals for the year 1899.*

| COUNTIES. | Horses, Mules, Asses and Jennets. | | Cattle. | | Sheep. | | Hogs. | |
|---|---|---|---|---|---|---|---|---|
| | Number. | Value. | Number. | Value. | Number. | Value. | Number. | Value. |
| Barbour | 3,536 | $ 75,552 00 | 11,431 | $ 186,299 00 | 8,546 | $ 17,146 00 | 829 | $ 2,326 00 |
| Berkeley | 4,526 | 124,090 00 | 5,308 | 73,130 00 | 7,946 | 18,890 00 | 1,311 | 6,590 00 |
| Boone | 1,725 | 73,026 00 | 3,086 | 47,406 00 | 1,157 | 1,220 00 | 1,691 | 4,531 00 |
| Braxton | 4,106 | 99,211 00 | 8,297 | 108,612 00 | 10,442 | 14,374 00 | 1,451 | 3,335 00 |
| Brooke | 1,401 | 35,500 00 | 2,044 | 31,440 00 | 12,515 | 19,070 00 | 280 | 1,640 00 |
| Cabell | 3,557 | 123,823 00 | 4,499 | 85,478 00 | 1,493 | 3,117 00 | 818 | 3,632 00 |
| Calhoun | 2,379 | 60,115 00 | 3,345 | 51,100 00 | 1,828 | 3,456 00 | 376 | 1,081 00 |
| Clay | 1,231 | 36,045 00 | 1,986 | 27,102 00 | 1,876 | 2,436 00 | 771 | 1,743 00 |
| Doddridge | 3,739 | 89,885 00 | 8,786 | 135,590 00 | 12,633 | 28,980 00 | 570 | 2,440 00 |
| Fayette | 3,687 | 121,908 00 | 4,927 | 75,445 00 | 2,051 | 2,354 00 | 716 | 2,250 00 |
| Gilmer | 3,219 | 88,783 00 | 7,231 | 132,067 00 | 7,259 | 19,650 00 | 518 | 1,912 00 |
| Grant | 2,080 | 47,521 00 | 6,310 | 97,189 00 | 9,174 | 26,048 00 | 1,571 | 4,418 00 |
| Greenbrier | 5,097 | 187,578 00 | 14,318 | 359,920 00 | 14,671 | 40,140 00 | 1,170 | 5,206 00 |
| Hampshire | 3,911 | 116,763 00 | 6,727 | 123,330 00 | 9,120 | 27,097 00 | 617 | 2,742 00 |
| Hancock | 1,350 | 46,033 00 | 2,059 | 35,380 00 | 4,903 | 9,635 00 | 240 | 1,641 00 |
| Hardy | 2,761 | 90,208 00 | 6,433 | 150,729 00 | 6,938 | 18,480 00 | 1,743 | 6,090 00 |
| Harrison | 6,869 | 207,125 00 | 20,948 | 417,155 00 | 23,501 | 55,345 00 | 1,420 | 5,535 00 |
| Jackson | 4,240 | 147,340 00 | 9,077 | 137,845 00 | 11,466 | 21,315 00 | 1,148 | 4,950 00 |
| Jefferson | 4,972 | 181,739 00 | 5,434 | 102,837 00 | 13,249 | 46,613 00 | 2,025 | 10,662 00 |
| Kanawha | 5,427 | 144,556 00 | 8,016 | 102,948 00 | 2,094 | 2,270 00 | 876 | 2,819 00 |
| Lewis | 4,744 | 115,745 00 | 16,013 | 279,365 00 | 20,499 | 46,360 00 | 1,142 | 4,103 00 |
| Lincoln | 2,757 | 98,047 00 | 4,236 | 74,413 00 | 2,071 | 2,159 00 | 1,509 | 4,540 00 |
| Logan | 1,239 | 36,516 00 | 2,445 | 26,388 00 | 1,141 | 1,141 00 | 1,344 | 2,254 00 |
| Marion | 5,760 | 184,836 00 | 10,791 | 192,007 00 | 8,530 | 20,428 00 | 1,795 | 6,987 00 |
| Marshall | 5,186 | 136,415 00 | 7,280 | 107,020 00 | 23,015 | 28,850 00 | 1,712 | 9,970 00 |
| Mason | 5,394 | 131,740 00 | 8,330 | 119,200 00 | 9,097 | 16,550 00 | 1,046 | 5,155 00 |
| Mercer | 2,885 | 76,805 00 | 8,435 | 63,485 00 | 5,074 | 6,985 00 | 512 | 1,775 00 |
| Mineral | 1,934 | 65,290 00 | 4,405 | 83,235 00 | 5,403 | 13,395 00 | 300 | 1,585 00 |
| Mingo | 1,166 | 37,440 00 | 2,205 | 28,072 00 | 1,434 | 1,434 00 | 1,279 | 2,725 00 |
| Monongalia | 5,239 | 155,448 00 | 13,452 | 230,141 00 | 15,084 | 32,711 00 | 1,476 | 5,545 00 |
| Morgan | 1,703 | 41,820 00 | 2,718 | 29,555 00 | 1,152 | 3,305 00 | 2,337 | 5,705 00 |
| Monroe | 4,357 | 118,555 00 | 10,643 | 177,670 00 | 10,450 | 22,245 00 | 944 | 4,085 00 |
| McDowell | 1,100 | 32,685 00 | 2,075 | 24,900 00 | 1,655 | 1,809 00 | 786 | 1,492 00 |
| Nicholas | 2,749 | 83,366 00 | 7,821 | 98,358 00 | 8,302 | 14,794 00 | 1,468 | 2,977 00 |
| Ohio | 2,342 | 88,755 00 | 2,523 | 41,600 00 | 10,590 | 10,590 00 | 311 | 1,940 00 |
| Pendleton | 3,005 | 64,510 00 | 8,653 | 160,400 00 | 16,491 | 33,910 00 | 2,174 | 3,939 00 |
| Pleasants | 1,963 | 73,330 00 | 2,714 | 47,660 00 | 2,315 | 4,541 00 | 307 | 1,749 00 |
| Pocahontas | 2,485 | 63,886 00 | 7,076 | 107,546 00 | 14,119 | 28,007 00 | 867 | 2,083 00 |
| Preston | 5,628 | 150,141 00 | 11,558 | 164,882 00 | 15,230 | 32,041 00 | 948 | 4,204 00 |
| Putnam | 2,957 | 81,475 00 | 4,363 | 57,975 00 | 3,645 | 4,290 00 | 500 | 2,275 00 |
| Raleigh | 2,275 | 59,147 00 | 4,562 | 44,573 00 | 3,158 | 3,372 00 | 726 | 1,250 00 |
| Randolph | 3,061 | 60,565 00 | 8,817 | 104,148 00 | 9,067 | 12,563 00 | 743 | 1,254 00 |
| Ritchie | 3,718 | 100,533 00 | 8,842 | 127,199 00 | 10,748 | 19,886 00 | 711 | 2,686 00 |
| Roane | 4,706 | 117,491 00 | 10,786 | 139,571 00 | 11,023 | 16,300 00 | 871 | 2,470 00 |
| Summers | 2,659 | 79,155 00 | 4,848 | 65,050 00 | 3,713 | 5,645 00 | 507 | 2,025 00 |
| Taylor | 2,353 | 71,620 00 | 5,729 | 116,685 00 | 6,577 | 16,845 00 | 630 | 2,740 00 |
| Tucker | 1,380 | 28,775 00 | 2,561 | 31,400 00 | 2,221 | 2,485 00 | 296 | 1,244 00 |
| Tyler | 4,427 | 170,020 00 | 6,714 | 112,465 00 | 5,800 | 12,135 00 | 528 | 2,700 00 |
| Upshur | 3,440 | 77,291 00 | 10,095 | 149,453 00 | 10,192 | 20,739 00 | 1,137 | 2,457 00 |
| Wayne | 4,461 | 166,708 00 | 8,875 | 156,752 00 | 2,728 | 4,412 00 | 2,687 | 8,358 00 |
| Webster | 1,565 | 34,820 00 | 2,836 | 29,028 00 | 3,182 | 4,031 00 | 799 | 1,400 00 |
| Wetzel | 5,119 | 115,577 00 | 6,691 | 52,203 00 | 9,441 | 8,698 00 | 1,306 | 5,041 00 |
| Wirt | 2,297 | 63,138 00 | 3,235 | 48,175 00 | 2,896 | 3,928 00 | 322 | 1,133 00 |
| Wood | 6,106 | 192,610 00 | 7,819 | 114,375 00 | 6,560 | 11,365 00 | 666 | 3,835 00 |
| Wyoming | 1,473 | 48,573 00 | 3,653 | 48,629 00 | 2,769 | 4,045 00 | 1,293 | 2,401 00 |
| Total | 183,350 | $5,319,623 00 | 374,091 | $5,934,580 00 | 428,234 | $ 849,630 00 | 56,120 | $ 191,125 00 |

# TABLE II.

*Showing the Number and Assessed Value of Farm Animals, including those under one year of age, for the year 1899.*

| COUNTIES. | Horses, Mules Asses and Jennets. | | Cattle. | | Sheep. | | Hogs. | |
|---|---|---|---|---|---|---|---|---|
| | Number. | Value. | Number. | Value. | Number. | Value. | Number. | Value. |
| Barbour | 4,420 | $ 84,440 00 | 15,241 | $ 232,874 00 | 12,819 | $ 25,719 00 | 8,790 | $ 14,268 00 |
| Berkeley | 5,657 | 155,112 00 | 7,077 | 91,412 00 | 11,919 | 28,335 00 | 12,110 | 36,087 00 |
| Boone | 2,156 | 91,275 00 | 4,114 | 59,257 00 | 1,735 | 1 830 00 | 16,910 | 25,076 00 |
| Braxton | 5,132 | 124,013 00 | 11,063 | 135,765 00 | 15,663 | 17,967 00 | 14,510 | 20,311 00 |
| Brooke | 1,751 | 44,375 00 | 2,725 | 39,300 00 | 18,772 | 28,605 00 | 2,830 | 8,771 00 |
| Cabell | 3,440 | 151,416 00 | 5,998 | 106,697 00 | 2,239 | 4,675 00 | 8,180 | 8,834 00 |
| Calhoun | 2,879 | 60,115 00 | 3,345 | 51,100 00 | 1,828 | 3,456 00 | 1,100 | 1,483 00 |
| Clay | 1,539 | 45,056 00 | 2,548 | 33,877 00 | 2,814 | 3,654 00 | 7,710 | 9,376 00 |
| Doddridge | 4,673 | 112,356 00 | 11,714 | 169,487 00 | 18,949 | 33,470 00 | 5,700 | 15,265 00 |
| Fayette | 4,608 | 182,860 00 | 6,569 | 94,306 00 | 3,076 | 3,531 00 | 7,160 | 11,915 00 |
| Gilmer | 4,135 | 121.108 00 | 10,022 | 179,266 00 | 12,663 | 33,358 00 | 4,490 | 9,827 00 |
| Grant | 2,600 | 59,401 00 | 8,413 | 121,486 00 | 13,761 | 39,072 00 | 15,710 | 25,626 00 |
| Greenbrier | 6,371 | 234,472 00 | 19,088 | 449,900 00 | 22,006 | 60,210 00 | 11,700 | 28,372 00 |
| Hampshire | 4,889 | 146,078 00 | 8,969 | 154,160 00 | 13,680 | 40,645 00 | 6,170 | 14,959 00 |
| Hancock | 1,687 | 57,541 00 | 2,745 | 5,295 00 | 7,354 | 14,452 00 | 2,400 | 8,121 00 |
| Hardy | 3,451 | 112,760 00 | 8,577 | 188,411 00 | 10,407 | 27,720 00 | 17,430 | 29,620 00 |
| Harrison | 8,586 | 258,906 00 | 27,930 | 521,443 00 | 35,251 | 83,017 00 | 14,200 | 31,095 00 |
| Jackson | 5,260 | 184,172 00 | 12,103 | 173,793 00 | 17,199 | 31,962 00 | 11,480 | 25,614 00 |
| Jefferson | 6,215 | 227,174 00 | 7,245 | 128,531 00 | 19,874 | 69,919 00 | 20,250 | 34,537 00 |
| Kanawha | 6,783 | 180,695 00 | 10,688 | 128,685 00 | 3,141 | 2,837 00 | 8,760 | 15,430 00 |
| Lewis | 5,967 | 143,056 00 | 21,350 | 349,206 00 | 30,748 | 69,540 00 | 11,420 | 18,500 00 |
| Lincoln | 3,446 | 122,558 00 | 5,648 | 93,016 00 | 3,106 | 3,238 00 | 15,090 | 24.911 00 |
| Logan | 1,542 | 45.645 00 | 3,260 | 32,985 00 | 1,711 | 1,711 00 | 13,440 | 14,350 00 |
| Marion | 7,200 | 231,045 00 | 14,888 | 240,008 00 | 12,795 | 30,642 00 | 17,950 | 39,297 00 |
| Marshall | 6,457 | 170,518 00 | 9,706 | 133,775 00 | 34,522 | 43,275 00 | 17,120 | 56,194 00 |
| Mason | 5,722 | 164,175 00 | 10,520 | 145,855 00 | 13,654 | 24,825 00 | 10,560 | 27,965 00 |
| Mercer | 3,606 | 96,006 00 | 7,246 | 79,356 00 | 7,611 | 10,477 00 | 5,120 | 9,608 00 |
| Mineral | 2,417 | 81,610 00 | 5,873 | 104,043 00 | 8,104 | 20,092 00 | 3,000 | 5,635 00 |
| Mingo | 1,969 | 70,877 00 | 3,667 | 42,468 00 | 2,625 | 2,625 00 | 14,750 | 13,450 00 |
| Monongalia | 6,548 | 194,310 00 | 17,936 | 287,676 00 | 22,626 | 49,066 00 | 14,760 | 26,799 00 |
| Morgan | 2,126 | 52,275 00 | 3,664 | 36,943 00 | 1,728 | 4,957 00 | 55,070 | 35,442 00 |
| Monroe | 5,321 | 148,193 00 | 14,180 | 222,080 00 | 15,675 | 33,367 00 | 9,440 | 21,077 00 |
| McDowell | 1,375 | 40,856 00 | 2,764 | 31,125 00 | 2,482 | 2,713 00 | 6,860 | 7,566 00 |
| Nicholas | 3,436 | 104,207 00 | 10,428 | 122,947 00 | 12,453 | 22,191 00 | 14,680 | 16,189 00 |
| Ohio | 2,125 | 69,820 00 | 3,710 | 50,900 00 | 15,855 | 15,885 00 | 3,110 | 10,616 00 |
| Pendleton | 3,756 | 80,637 00 | 14,204 | 200,500 00 | 24,736 | 50,863 00 | 21,740 | 20,568 00 |
| Pleasants | 2,453 | 91,662 00 | 3,618 | 59,575 00 | 3,472 | 6,911 00 | 3,070 | 8,656 00 |
| Pocahontas | 3,106 | 77,357 00 | 9,434 | 134,432 00 | 21,178 | 42,010 00 | 8,670 | 11,446 00 |
| Preston | 7,085 | 187,676 00 | 15,410 | 206,102 00 | 22,845 | 48,061 00 | 9,480 | 23,401 00 |
| Putnam | 3,696 | 101,843 00 | 5,817 | 72,468 00 | 5,467 | 6,435 00 | 5,000 | 11,275 00 |
| Raleigh | 2,843 | 73.934 00 | 6,082 | 55,716 00 | 4,737 | 5,058 00 | 7,260 | 6,967 00 |
| Randolph | 3,826 | 75,706 00 | 11,756 | 130,185 00 | 13,600 | 18,844 00 | 7,430 | 7,941 00 |
| Ritchie | 6,025 | 159,143 00 | 14,420 | 194,445 00 | 18,903 | 34,791 00 | 9,230 | 17,088 00 |
| Roane | 5,882 | 146,863 00 | 14,381 | 174,463 00 | 16,534 | 24,450 00 | 8,710 | 10,309 00 |
| Summers | 3,311 | 19,789 00 | 6,464 | 81,312 00 | 5,570 | 8,467 00 | 5,070 | 11,151 60 |
| Taylor | 2,941 | 89,525 00 | 7,638 | 145,856 00 | 9,865 | 25,267 00 | 6,300 | 14,080 00 |
| Tucker | 1,726 | 35,968 00 | 3,414 | 39,250 00 | 3,331 | 3,727 00 | 2,960 | 7,904 00 |
| Tyler | 5,533 | 212,525 00 | 8,952 | 140,581 00 | 8,850 | 18,202 00 | 5,280 | 15,056 00 |
| Upshur | 4,300 | 96,613 00 | 13,460 | 186,816 00 | 15,288 | 31,108 00 | 11,370 | 12,510 00 |
| Wayne | 5,573 | 208,135 00 | 11,833 | 195,940 00 | 4,092 | 6,618 00 | 26,870 | 44,632 00 |
| Webster | 1,956 | 43.525 00 | 3,781 | 36,285 00 | 4,773 | 6,046 00 | 7,990 | 7,871 00 |
| Wetzel | 6,398 | 141,471 00 | 8,921 | 65,253 00 | 14,161 | 13,047 00 | 13,000 | 28,549 00 |
| Wirt | 2,871 | 78,922 00 | 4,313 | 60,218 00 | 4,344 | 5,892 00 | 3,220 | 5,280 00 |
| Wood | 7,632 | 240,737 00 | 10.398 | 142,968 00 | 9,840 | 17,047 00 | 6,660 | 13,320 00 |
| Wyoming | 1,841 | 60,716 00 | 4,870 | 60,786 00 | 4,153 | 6,067 00 | 12,930 | 14,038 00 |
| **Total** | 227,692 | $6,594,223 00 | 499,680 | $7,423,609 00 | 646,611 | $1,267,949 00 | 592,407 | $ 999,198 00 |

## TABLE III.

*Showing the Number and Assessed Value of Farm Animals for the Year 1900.*

| COUNTIES. | Horses, Mules, Asses and Jennetts. | | Cattle. | | Sheep. | | Hogs | |
|---|---|---|---|---|---|---|---|---|
| | Number. | Value. | Number. | Value. | Number. | Value. | Number. | Value. |
| Barbour | 3,615 | $ 84,328 00 | 12,321 | $ 132,172 00 | 9,530 | $ 17,354 00 | 1,419 | $ 2,660 00 |
| Berkeley | 4,340 | 120,360 00 | 5,321 | 73,280 00 | 7,917 | 18,650 00 | 1,118 | 5,570 00 |
| Boone | 1,684 | 74,767 00 | 3,340 | 46,971 00 | 1,210 | 1,297 00 | 2,177 | 4,468 00 |
| Braxton | 2,663 | 63,808 00 | 5,707 | 74,012 00 | 7,007 | 9,562 00 | 816 | 1,981 00 |
| Brooke | 1,380 | 39,270 00 | 2,241 | 33,885 00 | 11,200 | 18,985 00 | 357 | 2,120 00 |
| Cabell | 3,073 | 111,765 00 | 4,352 | 81,378 00 | 1,657 | 3,480 00 | 582 | 2,560 00 |
| Calhoun | 581 | 15,439 00 | 1,037 | 15,597 00 | 591 | 1,174 00 | 100 | 316 00 |
| Clay | 1,236 | 37,377 00 | 2,029 | 28 021 00 | 1,749 | 2,485 00 | 1,084 | 1,781 00 |
| Doddridge | 3,764 | 104,840 00 | 9 721 | 148,910 00 | 12,981 | 27,110 00 | 690 | 2,665 00 |
| Fayette | 3,580 | 122,920 00 | 4,682 | 70,191 00 | 1,932 | 2,053 00 | 840 | 2,735 00 |
| Gilmer | 3,219 | 88,783 00 | 7,331 | 132,067 00 | 7,259 | 11,658 00 | 518 | 13,910 00 |
| Grant | 1,975 | 45 992 00 | 6,375 | 105,692 00 | 9,293 | 24,860 00 | 1,566 | 4,270 00 |
| Greenbrier | 5,080 | 205,448 00 | 15,349 | 373,102 00 | 15,886 | 42,089 00 | 1 009 | 4,642 00 |
| Hampshire | 3,776 | 123 739 00 | 5,804 | 139,039 00 | 9,207 | 25,998 00 | 737 | 3,120 00 |
| Hancock | 21,311 | 51,412 00 | 2,108 | 36,014 00 | 5,264 | 11,139 00 | 194 | 1,431 00 |
| Hardy | 2,640 | 91,733 00 | 6,988 | 159,292 00 | 8,298 | 18,412 00 | 2,126 | 7,423 00 |
| Harrison | 7,323 | 260,335 00 | 21,352 | 431,350 00 | 22,309 | 53,495 00 | 1,480 | 5,590 00 |
| Jackson | 5,335 | 157,560 00 | 9,373 | 138,360 00 | 11,851 | 21,723 00 | 799 | 3,760 00 |
| Jefferson | 4,595 | 167,717 00 | 5,623 | 105,132 00 | 15,354 | 54,046 00 | 1,952 | 10,248 00 |
| Kanawha | 5,292 | 145,395 00 | 7,525 | 103,186 00 | 2,184 | 2,446 00 | 678 | 2,187 00 |
| Lewis | 4,786 | 111,700 00 | 15,627 | 278,155 00 | 19,562 | 45,600 00 | 897 | 3,173 00 |
| Lincoln | 2,913 | 112,699 00 | 4,913 | 80,921 00 | 2,118 | 2,263 00 | 1,584 | 3,816 00 |
| Logan | 1,234 | 36,789 00 | 2,740 | 29,278 00 | 1,086 | 1,086 00 | 1,306 | 1,927 00 |
| Marion | 5,840 | 176,412 00 | 10,975 | 149,915 00 | 8,725 | 20,752 00 | 1,450 | 5,568 00 |
| Marshall | 2,810 | 66,040 00 | 3,841 | 61,090 00 | 15,516 | 18,875 00 | 1,143 | 5,710 00 |
| Mason | 5,166 | 143,470 00 | 8,419 | 119,955 00 | 9,459 | 15,355 00 | 887 | 1,275 00 |
| Mercer | 1,070 | 38,852 00 | 2,826 | 31,185 00 | 3,850 | 5,775 00 | 595 | 1,636 00 |
| Mineral | 1,872 | 63,210 00 | 4,351 | 82,913 00 | 5,256 | 12,982 00 | 311 | 1,581 00 |
| Mingo | 3,452 | 110,200 00 | 2,560 | 41,250 00 | 1,350 | 2,025 00 | 1,880 | 4,462 00 |
| Monongalia | 5,151 | 175,500 00 | 11 694 | 228,934 00 | 16,233 | 31,113 00 | 1,464 | 5,181 00 |
| Morgan | 1,432 | 40,735 00 | 2,645 | 28,200 00 | 998 | 2,880 00 | 1,385 | 5,020 00 |
| Monroe | 4,113 | 123,525 00 | 10 758 | 170,649 00 | 12,141 | 23,935 00 | 924 | 3,873 00 |
| McDowell | 1 200 | 35,652 00 | 2,250 | 22,500 00 | 1,700 | 1,853 00 | 680 | 1,292 00 |
| Nicholas | 2,343 | 75,802 00 | 7,382 | 89,579 00 | 6,890 | 11,830 00 | 1,526 | 2,682 00 |
| Ohio | 1,679 | 58,450 00 | 2,520 | 41,600 00 | 11,900 | 11,900 00 | 231 | 2,250 00 |
| Pendleton | 2,953 | 65,550 00 | 11,116 | 166,647 00 | 16,974 | 31,920 00 | 2,216 | 3,170 00 |
| Pleasants | 2 098 | 87,222 00 | 2,075 | 53,418 00 | 2,171 | 4,440 00 | 216 | 1,360 00 |
| Pocahontas | 2,250 | 57,847 00 | 6,850 | 101,120 00 | 14,100 | 27,918 00 | 795 | 1,908 00 |
| Preston | 5,401 | 161,371 00 | 12,056 | 176,361 00 | 14,638 | 30,049 00 | 844 | 3,754 00 |
| Putnam | 2,980 | 81,310 00 | 5,143 | 69,880 00 | 3,241 | 4,050 00 | 405 | 1,900 00 |
| Raleigh | 1,993 | 50,330 00 | 4,609 | 42,260 00 | 3,427 | 3,427 00 | 699 | 945 00 |
| Randolph | 2,189 | 64,700 00 | 9,099 | 533,668 00 | 8,976 | 13,163 00 | 654 | 1,129 00 |
| Ritchie | 4,750 | 129,751 00 | 11,551 | 167,345 00 | 12,205 | 23,289 00 | 766 | 2,948 00 |
| Roane | 4,645 | 119,033 00 | 11,125 | 138,504 00 | 11,844 | 16,483 00 | 517 | 1,574 00 |
| Summers | 2,507 | 77,135 00 | 5,138 | 65,135 00 | 3,830 | 5,670 00 | 322 | 1,255 00 |
| Taylor | 2,386 | 109,940 00 | 6,123 | 131,005 00 | 6,910 | 16,265 00 | 634 | 3,105 00 |
| Tucker | 1,348 | 31,375 00 | 2,635 | 32,695 00 | 1,895 | 2,635 00 | 221 | 833 00 |
| Tyler | 4,072 | 166,080 00 | 6,512 | 110,445 00 | 5,520 | 12,000 00 | 4,461 | 2,265 00 |
| Upshur | 3,387 | 85,540 00 | 9,605 | 160,171 00 | 9,816 | 19,621 00 | 1,274 | 2,560 00 |
| Wayne | 4,512 | 187,505 00 | 9,501 | 170,657 00 | 2,800 | 4,640 00 | 2,578 | 7,687 00 |
| Webster | 1,646 | 37,628 00 | 3,350 | 35,743 00 | 4,018 | 5,273 00 | 1,269 | 1,948 00 |
| Wetzel | 4,933 | 106,705 00 | 6 986 | 67,436 00 | 9,019 | 8,120 00 | 1,135 | 4,665 00 |
| Wirt | 2,290 | 65,826 00 | 3,597 | 51,881 00 | 2,914 | 3,620 00 | 270 | 1,020 00 |
| Wood | 5,929 | 191,925 00 | 8,196 | 121,130 00 | 6,345 | 11 640 00 | 559 | 2,845 00 |
| Wyoming | 1,453 | 51,399 00 | 3,631 | 42,928 00 | 2,801 | 3,902 00 | 1,472 | 2,145 00 |
| Total | 195,251 | $5,452,236 00 | 374,034 | $6,381,863 00 | 423,000 | $ 830,361 00 | 58,302 | $ 185,739 00 |

# TABLE IV.

*Showing the Number and Assessed Value of Farm Animals, including those under one year of age, for the year 1900.*

| COUNTIES. | Horses, Mules, Asses and Jennets. | | Cattle. | | Sheep. | | Hogs. | |
|---|---|---|---|---|---|---|---|---|
| | Number. | Value. | Number. | Value. | Number. | Value. | Number. | Value. |
| Barbour | 4,519 | $105,410 00 | 12,738 | $165,215 00 | 14,298 | $26,031 00 | 14,490 | $15,701 00 |
| Berkeley | 5,425 | 150,450 00 | 7,094 | 91,600 00 | 11,875 | 27,975 00 | 11,185 | 30,738 00 |
| Boone | 2,105 | 93,458 00 | 4,453 | 58,713 00 | 1,815 | 1,945 00 | 21,770 | 31,119 00 |
| Braxton | 3,330 | 81,510 00 | 7,609 | 92,515 00 | 10,510 | 14,343 00 | 8,160 | 9,325 00 |
| Brooke | 1,725 | 49,087 00 | 2,988 | 42,356 00 | 16,800 | 28,477 00 | 3,570 | 11,116 00 |
| Cabell | 3,841 | 139,706 00 | 4,802 | 101,722 00 | 2,485 | 5,220 00 | 5,820 | 6,286 00 |
| Calhoun | 726 | 19,298 00 | 1,449 | 19,496 00 | 891 | 1,761 00 | 1,000 | 1,666 00 |
| Clay | 1,545 | 46,721 00 | 2,705 | 35,101 00 | 2,623 | 3,727 00 | 10,840 | 14,463 00 |
| Doddridge | 4,705 | 131,050 00 | 12,961 | 186,175 00 | 19,471 | 40,665 00 | 6,500 | 14,365 00 |
| Fayette | 4,450 | 153,650 00 | 6,509 | 88,113 00 | 2,865 | 3,079 00 | 8,400 | 14,075 00 |
| Gilmer | 4,023 | 110,978 00 | 9,774 | 165,083 00 | 10,888 | 17,487 00 | 5,180 | 23,234 00 |
| Grant | 2,468 | 57,490 00 | 8,500 | 134,115 00 | 13,939 | 37,290 00 | 15,660 | 25,411 00 |
| Greenbrier | 6,350 | 256,810 00 | 20,465 | 466,325 00 | 23,829 | 63,133 00 | 10,090 | 24,620 00 |
| Hampshire | 4,720 | 153,423 00 | 7,737 | 173,798 00 | 13,810 | 38,997 00 | 7,370 | 32,305 00 |
| Hancock | 31,638 | 64,315 00 | 2,810 | 45,055 00 | 7,896 | 16,708 00 | 1,940 | 6,669 00 |
| Hardy | 3,300 | 114,666 00 | 9,311 | 199,115 00 | 12,447 | 27,618 00 | 21,260 | 36,124 00 |
| Harrison | 9,153 | 325,418 00 | 28,469 | 535,208 00 | 33,463 | 80,242 00 | 14,800 | 32,230 00 |
| Jackson | 6,669 | 196,950 00 | 12,497 | 172,959 00 | 17,776 | 32,584 00 | 7,990 | 18,142 00 |
| Jefferson | 5,743 | 209,646 00 | 7,497 | 131,790 00 | 23,031 | 81,069 00 | 19,520 | 33,262 00 |
| Kanawha | 6,615 | 183,860 00 | 10,033 | 131,107 00 | 3,276 | 3,669 00 | 5,730 | 12,491 00 |
| Lewis | 5,982 | 177,125 00 | 20,836 | 348,068 00 | 29,343 | 68,400 00 | 8,970 | 14,531 00 |
| Lincoln | 3,641 | 140,873 00 | 6,550 | 101,155 00 | 3,177 | 3,394 00 | 15,840 | 23,774 00 |
| Logan | 1,542 | 45,986 00 | 3,653 | 36,597 00 | 1,629 | 1,629 00 | 13,060 | 13,681 00 |
| Marion | 7,300 | 220,515 00 | 14,633 | 243,868 00 | 13,087 | 31,128 00 | 14,500 | 30,363 00 |
| Marshall | 3,512 | 82,550 00 | 5,125 | 76,362 00 | 23,274 | 28,312 00 | 11,430 | 31,427 00 |
| Mason | 6,407 | 179,337 00 | 11,215 | 149,944 00 | 14,188 | 23,032 00 | 8,870 | 23,434 00 |
| Mercer | 4,312 | 146,608 00 | 8,505 | 93,550 00 | 7,700 | 11,550 00 | 5,950 | 10,739 00 |
| Mineral | 2,340 | 79,012 00 | 5,805 | 103,641 00 | 7,884 | 19,473 00 | 3,110 | 8,578 00 |
| Mingo | 4,675 | 168,300 00 | 4,012 | 56,418 00 | 2,700 | 4,050 00 | 17,000 | 18,635 00 |
| Monongalia | 6,442 | 219,375 00 | 19,592 | 286,167 00 | 24,350 | 41,169 00 | 14,640 | 20,633 00 |
| Morgan | 1,790 | 50,918 00 | 3,526 | 35,362 00 | 1,497 | 4,320 00 | 19,850 | 10,739 00 |
| Monroe | 6,170 | 185,287 00 | 14,344 | 213,311 00 | 18,211 | 35,902 00 | 9,240 | 20,505 00 |
| McDowell | 1,500 | 44,315 00 | 3,000 | 28,125 00 | 2,550 | 2,779 00 | 6,800 | 7,106 00 |
| Nicholas | 2,928 | 94,752 00 | 9,842 | 111,973 00 | 10,335 | 17,745 00 | 15,260 | 12,983 00 |
| Ohio | 2,098 | 73,062 00 | 3,360 | 55,750 00 | 17,850 | 17,850 00 | 2,310 | 8,695 00 |
| Pendleton | 3,691 | 81,937 00 | 14,821 | 208,308 00 | 25,461 | 52,380 00 | 22,100 | 20,422 00 |
| Pleasants | 2,622 | 109,027 00 | 2,761 | 66,772 00 | 3,256 | 6,660 00 | 2,160 | 7,192 00 |
| Pocahontas | 2,812 | 72,308 00 | 9,133 | 130,150 00 | 21,150 | 41,877 00 | 7,950 | 8,586 00 |
| Preston | 6,755 | 201,713 00 | 16,074 | 220,455 00 | 21,957 | 45,073 00 | 8,440 | 20,845 00 |
| Putnam | 3,725 | 101,675 00 | 6,857 | 87,350 00 | 4,861 | 6,075 00 | 4,050 | 9,190 00 |
| Raleigh | 2,491 | 62,910 00 | 6,145 | 52,825 00 | 5,141 | 5,141 00 | 6,990 | 6,445 00 |
| Randolph | 2,736 | 80,875 00 | 12,132 | 642,082 00 | 13,420 | 197,446 00 | 6,540 | 7,015 00 |
| Ritchie | 5,937 | 162,188 00 | 15,401 | 209,181 00 | 18,307 | 34,933 00 | 7,660 | 14,228 00 |
| Roane | 5,806 | 148,791 00 | 14,833 | 173,130 00 | 17,766 | 24,724 00 | 5,175 | 8,561 00 |
| Summers | 3,134 | 96,419 00 | 6,850 | 82,669 00 | 5,795 | 8,555 00 | 3,320 | 7,051 00 |
| Taylor | 2,982 | 137,425 00 | 8,164 | 163,756 00 | 10,365 | 24,397 00 | 6,340 | 17,370 00 |
| Tucker | 1,685 | 392,218 00 | 3,513 | 40,868 00 | 2,842 | 3,952 00 | 2,210 | 4,811 00 |
| Tyler | 5,090 | 207,600 00 | 8,682 | 138,056 00 | 8,280 | 18,000 00 | 4,610 | 11,920 00 |
| Upshur | 4,233 | 106,925 00 | 12,806 | 200,213 00 | 14,769 | 29,432 00 | 12,740 | 14,026 00 |
| Wayne | 5,640 | 234,381 00 | 12,668 | 213,321 00 | 4,200 | 6,960 00 | 25,780 | 42,490 00 |
| Webster | 2,057 | 47,035 00 | 4,466 | 44,678 00 | 6,072 | 7,909 00 | 12,690 | 12,226 00 |
| Wetzel | 6,166 | 133,381 00 | 9,314 | 84,295 00 | 13,573 | 10,150 00 | 11,350 | 25,095 00 |
| Wirt | 2,862 | 82,282 00 | 4,796 | 64,855 00 | 4,317 | 5,430 00 | 2,700 | 5,880 00 |
| Wood | 7,411 | 239 906 00 | 10,929 | 155,537 00 | 9,517 | 17,460 00 | 5,590 | 14,422 00 |
| Wyoming | 1,816 | 67,598 00 | 4,841 | 53,660 00 | 4,201 | 5,853 00 | 14,720 | 15,434 00 |
| Total | 253,840 | 7,318 905 00 | 999,585 | 8,006,009 00 | 637,013 | 1,425,160 00 | 540 180 | 922,373 00 |

# TABLE V.

*Showing the Average Assessed Value per Head of Horses, Mules, Asses and Jennets; Cattle, Sheep and Hogs by Counties.*

| COUNTIES. | Average Value of Horses, Mules, Asses and Jennets | Average Value of Cattle. | Average Value of Sheep. | Average Value of Hogs. |
|---|---|---|---|---|
| Barbour | $ 21 31 | $ 16 30 | $ 2 01 | $ 2 81 |
| Berkeley | 27 42 | 13 78 | 2 38 | 5 03 |
| Boone | 42 33 | 15 36 | 1 05 | 2 68 |
| Braxton | 24 16 | 13 09 | 1 37 | 2 30 |
| Brooke | 25 34 | 15 38 | 1 52 | 5 86 |
| Cabell | 34 81 | 19 00 | 2 09 | 4 44 |
| Calhoun | 25 27 | 15 28 | 1 89 | 2 88 |
| Clay | 27 28 | 13 65 | 1 30 | 2 26 |
| Doddridge | 24 04 | 15 43 | 2 22 | 4 28 |
| Fayette | 33 06 | 15 31 | 1 15 | 3 14 |
| Gilmer | 27 58 | 18 26 | 2 71 | 3 69 |
| Grant | 22 85 | 15 40 | 2 84 | 2 81 |
| Greenbrier | 26 80 | 25 12 | 2 74 | 4 45 |
| Hampshire | 29 86 | 18 63 | 2 97 | 4 44 |
| Hancock | 34 10 | 17 18 | 1 97 | 6 81 |
| Hardy | 32 31 | 23 43 | 2 66 | 3 49 |
| Harrison | 30 15 | 19 92 | 2 36 | 3 90 |
| Jackson | 34 75 | 15 19 | 1 86 | 4 31 |
| Jefferson | 36 55 | 18 92 | 3 52 | 5 22 |
| Kanawha | 26 64 | 12 84 | 1 08 | 3 22 |
| Lewis | 24 39 | 17 45 | 2 26 | 3 59 |
| Lincoln | 35 56 | 17 57 | 1 04 | 3 01 |
| Logan | 29 47 | 10 79 | 1 00 | 1 68 |
| Marion | 31 92 | 17 79 | 2 39 | 3 81 |
| Marshall | 26 80 | 14 70 | 1 25 | 5 82 |
| Mason | 24 45 | 14 31 | 1 82 | 4 93 |
| Mercer | 26 62 | 7 53 | 1 38 | 3 47 |
| Mineral | 33 76 | 18 90 | 2 47 | 5 28 |
| Mingo | 32 11 | 12 73 | 1 00 | 2 13 |
| Monongalia | 29 67 | 17 11 | 2 17 | 3 76 |
| Morgan | 24 56 | 10 76 | 2 87 | 2 44 |
| Monroe | 27 85 | 16 69 | 2 13 | 4 33 |
| McDowell | 29 71 | 10 07 | 1 09 | 1 90 |
| Nicholas | 30 33 | 12 58 | 1 79 | 2 03 |
| Ohio | 37 89 | 16 49 | 1 00 | 6 24 |
| Pendleton | 21 47 | 18 54 | 2 06 | 1 81 |
| Pleasants | 37 36 | 17 56 | 1 96 | 5 70 |
| Pocahontas | 25 71 | 15 20 | 1 98 | 2 40 |
| Preston | 26 61 | 14 27 | 2 10 | 4 43 |
| Putnam | 27 55 | 13 28 | 1 18 | 4 55 |
| Raleigh | 26 01 | 9 77 | 1 07 | 1 72 |
| Randolph | 19 79 | 11 70 | 1 89 | 1 69 |
| Ritchie | 27 04 | 14 39 | 1 85 | 3 78 |
| Roane | 24 97 | 12 94 | 1 48 | 2 83 |
| Summers | 29 84 | 13 42 | 1 52 | 3 99 |
| Taylor | 30 44 | 20 37 | 2 56 | 4 35 |
| Tucker | 20 85 | 12 22 | 1 12 | 4 20 |
| Tyler | 33 41 | 16 76 | 2 09 | 5 11 |
| Upshur | 22 47 | 14 80 | 2 03 | 2 16 |
| Wayne | 37 37 | 17 79 | 1 62 | 3 11 |
| Webster | 22 25 | 10 24 | 1 27 | 1 75 |
| Wetzel | 22 57 | 7 80 | 92 | 3 86 |
| Wirt | 27 49 | 14 89 | 1 36 | 3 52 |
| Wood | 31 54 | 14 63 | 1 73 | 5 01 |
| Wyoming | 32 98 | 13 31 | 1 46 | 1 93 |
| Total | $ 29 01 | $ 15 86 | $ 1 98 | $ 3 41 |

# TABLE VI.

*Showing the Acreage and Yield of the Principal Crops in West Virginia by Counties, October 1, 1900.*

| COUNTIES. | Corn. | | Wheat. | | Oats. | | Irish Potatoes | | Hay. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Acres. | Bushels. | Acres. | Bushels. | Acres. | Bushels. | Acres. | Bushels. | Acres. | Tons. |
| Barbour | 10,500 | 262,500 | 5,400 | 43,200 | 3,450 | 72,450 | 490 | 29,500 | 17,500 | 13,125 |
| Berkeley | 20,000 | 460,000 | 7,000 | 189,000 | 2,000 | 40,000 | 580 | 29,200 | 15,200 | 11,400 |
| Boone | 11,800 | 259,000 | 1,700 | 8,900 | 2,100 | 37,800 | 400 | 20,000 | 1,200 | 900 |
| Braxton | 13,500 | 340,500 | 8,700 | 70,600 | 1,600 | 32,000 | 500 | 25,000 | 12,600 | 12,600 |
| Brooke | 4 600 | 128,800 | 3,200 | 19,200 | 2,600 | 54,600 | 490 | 24,500 | 7,800 | 5,850 |
| Cabell | 17,200 | 516,000 | 7 600 | 60,800 | 3,500 | 70,000 | 1,000 | 62,000 | 3,600 | 4,500 |
| Calhoun | 10,500 | 262,500 | 4,100 | 28,700 | 2,700 | 70,200 | 500 | 22,500 | 7,400 | 5,550 |
| Clay | 5,800 | 116,000 | 1,500 | 9,00 | 1,800 | 37,800 | 300 | 12,000 | 2,700 | 1,350 |
| Doddridge | 11,000 | 308,000 | 7,200 | 50,400 | 2,000 | 50,000 | 600 | 33,000 | 14,600 | 10,950 |
| Fayette | 11,500 | 276,000 | 3,100 | 21,700 | 7,000 | 147,000 | 900 | 36,000 | 8,000 | 6,000 |
| Gilmer | 9,600 | 240,000 | 5,600 | 39,200 | 900 | 22,500 | 700 | 31,500 | 9,600 | 8,400 |
| Grant | 6,400 | 153,600 | 4,800 | 25,800 | 2,700 | 54,000 | 400 | 18,000 | 8,400 | 4,200 |
| Greenbrier | 14,900 | 372,500 | 9,100 | 63,700 | 8,700 | 182,700 | 400 | 20,000 | 21,000 | 10,500 |
| Hampshire | 12,200 | 244,000 | 9,000 | 63,000 | 5,500 | 110,000 | 600 | 27,000 | 10,600 | 6,360 |
| Hancock | 2,800 | 84,000 | 2,500 | 15,000 | 2,700 | 67,500 | 500 | 28,000 | 8,400 | 6,300 |
| Hardy | 8,000 | 190,000 | 4,500 | 31,500 | 2,000 | 40,000 | 400 | 18,000 | 3,000 | 1,500 |
| Harrison | 14,000 | 420,000 | 11,000 | 88,000 | 3,800 | 95,000 | 600 | 37,200 | 24,000 | 18,000 |
| Jackson | 18,000 | 540,000 | 12,000 | 84,000 | 3,600 | 90,000 | 1,400 | 109,000 | 18,000 | 13,500 |
| Jefferson | 19,200 | 576,000 | 29,000 | 203,000 | 700 | 14,000 | 500 | 32,500 | 19,000 | 14,250 |
| Kanawha | 25,400 | 762,000 | 10,300 | 72,100 | 8,000 | 200,000 | 1,600 | 120,000 | 8,000 | 4,000 |
| Lewis | 11,300 | 348,000 | 7,800 | 54,600 | 1,500 | 30,000 | 800 | 52,000 | 17,500 | 10,500 |
| Lincoln | 20,400 | 510,000 | 5,400 | 32,400 | 3,500 | 70,000 | 600 | 37,200 | 3,000 | 2,400 |
| Logan | 10,200 | 224,400 | 500 | 3,500 | 900 | 18,900 | 400 | 19,200 | 800 | 480 |
| Marion | 11,000 | 330,000 | 9,500 | 66,500 | 4,900 | 102,900 | 700 | 38,500 | 18,500 | 13,866 |
| Marshall | 18,500 | 592,000 | 15,200 | 91,200 | 10,200 | 255,000 | 1,900 | 133,000 | 18,000 | 13,500 |
| Mason | 22,200 | 800,200 | 15,100 | 120,800 | 4,000 | 104,000 | 1,850 | 147,600 | 15,000 | 11,250 |
| Mercer | 10,500 | 235,000 | 6,400 | 44,800 | 5,100 | 102,000 | 500 | 36,000 | 8,000 | 4,800 |
| Mineral | 5,000 | 275,000 | 4,000 | 28,000 | 3,200 | 57,600 | 500 | 37,500 | 1,000 | 6,000 |
| Mingo | 8,300 | 207,500 | 500 | 3,500 | 1,600 | 32,000 | 300 | 15,000 | 600 | 450 |
| Monongalia | 13,000 | 468,000 | 9,000 | 72,000 | 6,000 | 156,000 | 500 | 49,000 | 21,000 | 15,666 |
| Morgan | 6,700 | 174,200 | 4,600 | 27,600 | 1,500 | 30,000 | 300 | 21,500 | 4,100 | 2,460 |
| Monroe | 12,000 | 384,000 | 9,200 | 64,400 | 4,200 | 88,200 | 250 | 18,750 | 12,200 | 7,320 |
| McDowell | 5,200 | 156,400 | 350 | 2,250 | 2,100 | 42,000 | 400 | 22,400 | 700 | 420 |
| Nicholas | 10,250 | 266,500 | 3,700 | 24,900 | 4,000 | 72,000 | 550 | 41,800 | 12,100 | 650 |
| Ohio | 5,400 | 194,800 | 4,200 | 25,200 | 4,000 | 100,000 | 800 | 75,200 | 10,600 | 9,275 |
| Pendleton | 7,650 | 214,200 | 6,650 | 40,550 | 2,200 | 39,600 | 550 | 42,900 | 13,100 | 9,825 |
| Pleasants | 6,500 | 195,000 | 2,300 | 15,100 | 800 | 16,000 | 500 | 49,500 | 5,500 | 3,300 |
| Pocahontas | 5,000 | 150,000 | 3,650 | 22,550 | 3,500 | 70,000 | 450 | 33,750 | 16,250 | 9,750 |
| Preston | 9,350 | 233,750 | 4,600 | 27,600 | 11,500 | 207,000 | 750 | 61,500 | 29,850 | 17,910 |
| Putnam | 13,000 | 558,000 | 7,000 | 56,000 | 4,000 | 100,000 | 600 | 59,400 | 6,500 | 5,684 |
| Raleigh | 9,450 | 236,250 | 4,250 | 25,500 | 5,200 | 93,600 | 500 | 49,000 | 9,200 | 5,520 |
| Randolph | 7,550 | 181,200 | 3,500 | 19,000 | 3,600 | 64,800 | 650 | 57,200 | 22,150 | 13,290 |
| Ritchie | 13,300 | 465,500 | 8,650 | 52,550 | 2,100 | 42,000 | 850 | 46,750 | 16,600 | 14,525 |
| Roane | 20,250 | 567,000 | 12,500 | 87,500 | 2,600 | 52,000 | 750 | 80,750 | 16,450 | 9,870 |
| Summers | 9,300 | 279,000 | 4,650 | 32,550 | 3,550 | 74,550 | 500 | 47,500 | 7,200 | 5,280 |
| Taylor | 5,000 | 455,000 | 4,900 | 39,200 | 2,000 | 40,000 | 325 | 30,650 | 9,875 | 5,925 |
| Tucker | 3,650 | 102,200 | 6,200 | 37,200 | 1,600 | 32,000 | 200 | 18,400 | 5,700 | 3,420 |
| Tyler | 10,600 | 318,000 | 7,250 | 50,750 | 2,300 | 48,300 | 750 | 71,250 | 13,450 | 11,767 |
| Upshur | 10,250 | 317,750 | 4,725 | 33,075 | 3,500 | 73,500 | 550 | 41,400 | 15,600 | 9,360 |
| Wayne | 32,100 | 802,500 | 7,550 | 52,750 | 1,750 | 35,500 | 890 | 89,550 | 3,800 | 2,280 |
| Webster | 5,200 | 109,200 | 1,400 | 8,400 | 1,600 | 28,800 | 250 | 22,250 | 8,000 | 4,800 |
| Wetzel | 17,525 | 444,125 | 10,630 | 74,410 | 4,860 | 102,060 | 1,000 | 95,000 | 14,500 | 8,700 |
| Wirt | 9,250 | 240,500 | 5,600 | 39,200 | 2,100 | 42,000 | 650 | 57,850 | 8,000 | 4,800 |
| Wood | 16,950 | 474,600 | 13,625 | 95,375 | 4,400 | 105,600 | 1,350 | 132,300 | 18,850 | 16,492 |
| Wyoming | 9,200 | 202,400 | 1,500 | 10,500 | 2,850 | 57,000 | 425 | 36,125 | 2,100 | 1,260 |
| The State | 637,925 | 17 923,575 | 383,380 | 2 668,210 | 184,060 | 4 071,960 | 35,550 | 2 602,775 | 606,375 | 421530 |

### *Showing Number of Miles of Macadam Roads in the State by Counties, with the Annual Expenditure on all Roads, etc., together with the Supply and Efficiency, etc., of Farm Labor.*

| COUNTIES. | How many Miles of Macadam Roads in your county. | What is the Total Annual expenditure on your public Roads. | Does the Present System give general Satisfaction. | Is Farm Labor Plentiful or Scarce. | What is the Character & efficiency of Farm Labor | What are the Average Prices Paid for Farm Labor. | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Miles. | $ | Answer. | Answer. | Answer. | Per day without board. | Per day with Board | Per month without board. | Per month with board. |
| Barbour | 50 | 11,200 | No | Scarce | Only fair | 1 00 | .75 | 25 00 | 15.00 |
| Berkeley | 30 | 12,000 | No | Scarce | Fair | 1.00 | 50 | | 12.00 |
| Boone | | 2,000 | No | Plentiful | Good | | .50 | | |
| Braxton | | 12,000 | No | Scarce | Medium | 1 25 | 1.00 | 25.00 | 20 00 |
| Brooke | 50 | 8,500 | No | Very scarce | Not at all | 1.25 | .75 | 25.00 | 15.00 |
| Cabell | | 17,000 | No | At good prices | Favorable | 1 00 | .50 | | 15.00 |
| Calhoun | | 6,300 | With right officers. | Plentiful | Fair | .75 | .50 | 20.00 | 13.00 |
| Clay | | 3,600 | No | Scarce | Unskilled | 1 00 | .75 | | 20.00 |
| Doddridge | 20 | 14,000 | No | Scarce | Medium | 1.00 | .70 | 25.00 | 18.00 |
| Fayette | | 23,000 | No | Very scarce | Fair | 1.00 | .75 | 20.00 | 15 00 |
| Gilmer | | 9,000 | Not very good. | Plentiful | Average. | 1.00 | .60 | | |
| Grant | | 5,500 | No | Scarce | Ordinary | 1.00 | .50 | 20.00 | 11 00 |
| Greenbrier | 35 | 16,500 | | Scarce | | .75 | .50 | 18.00 | 13.00 |
| Hampshire | | 7,000 | Yes | Very scarce | Good | 1 00 | .75 | 18.00 | 13.00 |
| Hancock | 30 | 8,000 | No | Scarce | Not good | 1.00 | .75 | 25.00 | 16.00 |
| Hardy | | 8,000 | No | Scarce | Favorable | .75 | .50 | 18.00 | 12.00 |
| Harrison | 100 | 20,500 | | Scarce | Not efficient | 1 25 | 1.00 | 20.00 | 15.00 |
| Jackson | | | | | | | | | |
| Jefferson | 60 | 11,000 | Yes | Rather scarce. | Medium | 1 00 | .75 | 18 00 | 12.00 |
| Kanawha | | 20,000 | No | Scarce | Not efficient | 1 00 | .75 | 20.00 | 18.00 |
| Lewis | 15 | 9,000 | Reasonable. | Scarce | Not favor'ble | 1.00 | .75 | 20 00 | 15.00 |
| Lincoln | | 5,500 | No | Plentiful | | 1.00 | .75 | 25.00 | 16.00 |
| Logan | | 8,000 | No | Scarce | Poor | 1 00 | .75 | | 13.00 |
| Marion | 20 | 31,000 | Not very good. | Scarce | Good | 1 25 | 1.00 | 20.00 | 16.00 |
| Marshall | 58 | 51,500 | No | Scarce | Poor | 1 50 | 1.00 | 25.00 | 15.00 |
| Mason | | 16,000 | Not very good. | Very scarce | Fair | 1.00 | .75 | 20 00 | 13.00 |
| Mercer | 12 | 18,000 | Yes | Scarce | Fair | 1.00 | .75 | 30.00 | 25.00 |
| Mineral | | 15,200 | Yes | Very scarce | Fair | .75 | .60 | 20 00 | 15 00 |
| Mingo | | 6,000 | No | Scarce | Very good | 1.00 | .75 | | 20.00 |
| Monongalia | 10 | 21,000 | No | Scarce | Good | 1 00 | .75 | 25.00 | 15.00 |
| Morgan | | 8,600 | No | Plentiful | Very good | .75 | .50 | 15 00 | 11.00 |
| Monroe | | 15,500 | No | Scarce | Poor | .75 | .50 | 18 00 | 12.00 |
| McDowell | | 4,000 | No | Scarce | | 1.00 | .75 | 25.00 | 20.00 |
| Nicholas | | 6,000 | No | Scarce | Average | 1 00 | .65 | 25.00 | 18.00 |
| Ohio | 135 | 13,000 | Not entirely. | Very scarce | Fair | 1.25 | 1.00 | 25.00 | 18 00 |
| Pendleton | | 9,500 | No | Plentiful | Fair | .75 | .50 | 18.00 | 12 00 |
| Pleasants | | 7,000 | No | Scarce | Fair | 1.00 | .75 | 25 00 | 15.00 |
| Pocahontas | | 8,000 | No | Scarce | Fair | 1.00 | .75 | 25.00 | 15 00 |
| Preston | | 18,000 | No | Scarce | Fair | 1 00 | .75 | 20.00 | 15.00 |
| Putnam | | 8,000 | No | Scarce | Average. | .75 | .50 | 18.00 | 13 00 |
| Raleigh | | 8,200 | No | Scarce | Inferior | .75 | .50 | | 13.00 |
| Randolph | | 12,000 | Is not. | Scarce | Bad | 1 00 | .75 | 25.00 | 15.00 |
| Ritchie | 1 | 20,000 | No | Scarce | Good | 1.00 | .75 | 18.00 | 12.00 |
| Roane | | 13,000 | No | Scarce | Not good | 1.00 | .75 | 20.00 | 15.00 |
| Summers | | 10,500 | No | Scarce | Fair | .75 | .50 | 18,00 | 13.00 |
| Taylor | | 10,000 | Is not. | Scarce | Indifferent | 1.25 | .75 | 25 00 | 15.00 |
| Tucker | | | | | | | | | |
| Tyler | 10 | 12,000 | No | Plentiful | Fair | 1.25 | .75 | 20.00 | 17 00 |
| Upshur | | 15,000 | No | Scarce | Not favor'ble | 1.00 | .75 | 25.00 | 15.00 |
| Wayne | | 12,500 | No | Scarce | Average | .80 | .60 | | 13 00 |
| Webster | | 5,500 | No | Scarce | Unskilled | | 1.00 | | |
| Wetzel | | 14,000 | No | Scarce | Not good | 1.00 | ,75 | 20.00 | 16.00 |
| Wirt | | 6,000 | No | Scarce | Not the best. | 1.00 | .75 | 20.00 | 15.00 |
| Wood | | 18,000 | No | Scarce | Average | 1 00 | .75 | 25.00 | 15.00 |
| Wyoming | | 5,000 | No | Scarce | Fair | 1.00 | ,75 | 25.00 | 20.00 |
| Total | 636 | $ 650,600 | | | | .96 | .71 | 21.79 | 15.18 |

## *Showing the Coal Beds and Average Thickness of each; the proportion of Coal and Timber Lands owned by Foreign Capitalists; the value of Timber Lands after Merchantable Timber is removed, and Timber Lands cleared in last two years, etc.*

| COUNTIES. | The Coal Beds and Thickness of each, underlying the County | | | Proportion owned by foreign capitalists. | What per cent. of merchantable timber lands are held by alien owners. | Is there much timber left standing that would grow into value? | The price of these timber lands per acre. | What per cent., if any, has been cleared for farming or grazing purposes in last two years. |
|---|---|---|---|---|---|---|---|---|
| | Upper. | Middle | Lower. | Per cent. | Per cent. | | | Per cent. |
| Barbour | 5 feet | 7-10 feet | 11 feet. | 50 | None. | Yes. | $ 8 00 | 20 |
| Berkeley | | | | | None. | | None on market. | 5 |
| Boone | 13 feet. | | | 60 | 60 | Yes. | 5 00 | |
| Braxton | 5 feet. | 4 feet | 10 feet | None. | 10 | Yes. | 10 00 | 10 |
| Brooke | 5 feet. | | | 20 | None. | | | |
| Cabell | | | | | | Very littlc. | 8 00 | 10 |
| Calhoun | | | | | 5 | Yes. | 6 00 | 6 |
| Clay | 3½ feet. | 7 feet. | 5⅝ feet. | 80 | 60 | Yes. | 10 00 | |
| Doddridge | 18 inch. | | | | 5 | Yes. | 10 00 | 5 |
| Fayette | 3 feet. | 6 feet. | | 50 | 75 | Yes. | 7 00 | 2 |
| Gilmer | 7 feet. | | | 27,000 a. optional. | 75 | Yes. | 10 00 | 2 |
| Grant | | | | | 50 | Yes. | 6 00 | 5 |
| Greenbrier | | | | | | | | |
| Hampshire | | | | | 75 | Yes. | 1 00 | 25 |
| Hancock | 3 feet. | | 6 feet. | 25 | None. | | 25 00 | |
| Hardy | | | | | 10 | Yes. | 6 00 | 5 |
| Harrison | 4 feet. | 9 feet. | | 90 | | No. | | 8 |
| Jackson | | | | | | | | |
| Jefferson | | | | | 20 | Very little. | 35 00 | 5 |
| Kanawha | 5 feet. | 4½ feet. | 3 feet | 50 | | Very little. | 5 00 | 8 |
| Lewis | 4 feet. | 7 feet. | 8 feet | None | | No. | 15 00 | 10 |
| Lincoln | 4 feet | 5 feet | 6 feet | 33 | 10 | Yes. | 3 00 | |
| Logan | 8 feet | 6 feet | 4½ feet. | 50 | 66 | Yes. | 5 00 | 2 |
| Marion | 4 feet. | 7 feet | 9 feet | 80 | 5 | Very little | 12 00 | 6 |
| Marshall | 2½ feet | 6 feet | 9 feet. | 5 | None. | No. | 30 00 | 10 |
| Mason | 4½ feet | 5 feet | 5 feet. | 80 | None. | Yes. | 7 00 | 1 |
| Mercer | 3 feet | 9 feet. | 5 feet. | 25 | 60 | Yes. | 4 00 | 5 |
| Mineral | 16 feet. | 8 feet. | | 80 | None. | Yes. | 2 00 | |
| Mingo | 4 feet. | 5 feet | 5 feet. | 90 | 60 | Yes. | 4 00 | 10 |
| Monongalia | 7 feet | 9 feet. | 4 f. et. | 30 | None. | No. | 10 00 | 2 |
| Monroe | | | | | 30 | Yes. | 3 00 | 2 |
| Morgan | | | | | None | Yes. | 2 00 | 8 |
| McDowell | 3 feet | 6 feet. | 10 feet. | 60 | 40 | Yes. | 3 00 | |
| Nicholas | 6 feet. | 4 feet | | 10 | 50 | Yes. | 5 00 | 2 |
| Ohio | 4 feet. | 6 feet. | | 8 | None. | Yes. | 25 00 | |
| Pendleton | | | | | 25 | Yes. | 4 00 | 2 |
| Pleasants | | | | | | No. | 10 00 | |
| Pocahontas | | | | | 50 | Yes | 4 00 | 8 |
| Preston | 4 feet. | 6 feet | 9 f. et. | 8 | Very little. | Some. | 4 00 | |
| Putnam | | | | | | Yes. | 10 00 | 10 |
| Raleigh | 5½ feet. | 3 feet | 4 feet | 50 | 50 | Yes. | | 5 |
| Randolph | 4 feet. | 9 feet | 8 feet | 80 | 70 | Some. | 8 00 | 6 |
| Ritchie | | | | | 60 | Yes. | 4 00 | 5 |
| Roane | 2 feet. | 3 feet. | 5 feet | | 2 | Some. | 5 00 | 2 |
| Summers | | | | | 1 | Yes. | 5 00 | 2 |
| Taylor | | | | | | | | |
| Tucker | 4 feet | 8 feet. | 6 feet | 90 | 50 | Some. | 2 00 | 1 |
| Tyler | | | | | Nove. | Yes. | 10 00 | 8 |
| Upshur | 2½ feet. | 4½ feet. | 6 feet | 75 | 5 | Some. | 7 00 | 2 |
| Wayne | | 3 feet. | 6 feet. | 90 | 20 | Some. | 3 00 | 4 |
| Webster | | 3 feet | 5 feet | very little | 75 | Yes. | 8 00 | 3 |
| Wetzel | 6 feet. | | 9 seet. | 5 | 2 | Yes. | 15 00 | 2 |
| Wirt | | | | | 5 | No | 3 00 | 5 |
| Wood | | | | | Very little. | Yes. | 10 00 | 1 |
| Wyoming | 4 feet. | 9 feet | | | 75 | Yes. | 4 00 | 5 |
| Average | | | | | | | $ 8 18 | 5.71 |

## CROP CONDITIONS, OCTOBER 1, 1900.

| States and Territories. | Oats. |  | Barley. |  | Rye. |  | Corn—Average condition Oct 1. | Buckwheat—Average condition Oct. 1. | Tobacco—Average condition Oct. 1. | Irish Potatoes—Average condition Oct. 1. | Sweet Potatoes—Average condition Oct. 1. | Sorghum—Average condition Oct. 1. | Apples—Average condition Oct. 1. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Average yield per acre in 1900. | Average quality in 1900. | Average yield per acre in 1900. | Average quality in 1900. | Average yield per year in 1900. | Average quality in 1900. |  |  |  |  |  |  |  |
|  | Bush | Per ct | Bush | P.ct | Bush | P.ct | Per ct | Per ct | Per ct | Per ct | Per ct | Per ct | P.ct |
| Maine | 38 | 94 | 27 | 93 | 17 | 90 | 90 | 89 | ...... | 76 | ...... | ...... | 97 |
| New Hampshire | 33 | 94 | 23 | 90 | 17 | 93 | 93 | 91 | 110 | 74 | ...... | ...... | 104 |
| Vermont | 35 | 97 | 29 | 97 | 17 | 97 | 100 | 94 | ...... | 94 | ...... | ...... | 101 |
| Massachusetts | 37 | 90 | 26 | 87 | 17 | 90 | 92 | 87 | 102 | 69 | ...... | ...... | 85 |
| Rhode Island | 31 | 96 | 28 | 97 | ...... | .... | 94 | ...... | ...... | 68 | ...... | ...... | 86 |
| Connecticut | 31 | 94 | ...... | ... | 17 | 100 | 90 | 81 | 102 | 65 | ...... | ...... | 70 |
| New York | 28 | 91 | 22 | 94 | 15 | 94 | 91 | 70 | 89 | 75 | ...... | ...... | 89 |
| New Jersey | 30 | 92 | ...... | ... | 16 | 97 | 84 | 80 | ...... | 68 | 94 | ...... | 57 |
| Pennsylvania | 81 | 89 | 19 | 93 | 15 | 92 | 73 | 68 | 78 | 60 | 72 | ...... | 75 |
| Delaware | 21 | 85 | ...... | ... | ...... | .... | 74 | 65 | ...... | 59 | 75 | ...... | 78 |
| Maryland | 24 | 89 | ...... | ... | 16 | 96 | 75 | 84 | 77 | 64 | 80 | ...... | 76 |
| Virginia | 15 | 84 | ...... | ... | 10 | 95 | 62 | 67 | 58 | 60 | 64 | 66 | 44 |
| North Carolina | 14 | 84 | ...... | ... | 9 | 91 | 65 | 71 | 66 | 75 | 68 | 72 | 62 |
| South Carolina | 16 | 85 | ...... | ... | 8 | 86 | 60 | ...... | 79 | 90 | 64 | 63 | 54 |
| Georgia | 15 | 84 | ...... | ... | 7 | 90 | 78 | ...... | 88 | 87 | 83 | 77 | 50 |
| Florida | 11 | 79 | ...... | ... | ...... | ... | 76 | ...... | 94 | 82 | 88 | ...... | 57 |
| Alabama | 14 | 80 | ...... | ... | 8 | 84 | 66 | ...... | 86 | 82 | 89 | 77 | 63 |
| Mississippi | 14 | 83 | ...... | .... | ...... | ... | 50 | ...... | 65 | 79 | 86 | 71 | 62 |
| Louisiana | 18 | 90 | ...... | .... | ...... | .... | 80 | ...... | 90 | 85 | 92 | 96 | 88 |
| Texas | 38 | 93 | 25 | 97 | 16 | 97 | 72 | ...... | 79 | 70 | 86 | 94 | 80 |
| Arkansas | 22 | 87 | ...... | ... | 12 | 85 | 74 | ...... | 87 | 81 | 86 | 83 | 44 |
| Tennessee | 17 | 83 | 15 | 80 | 11 | 92 | 67 | 80 | 72 | 80 | 83 | 87 | 53 |
| West Virginia | 21 | 89 | ...... | .... | 10 | 90 | 84 | 76 | 91 | 83 | 90 | 91 | 33 |
| Kentucky | 21 | 90 | 29 | 100 | 13 | 92 | 83 | ...... | 84 | 86 | 83 | 85 | 45 |
| Ohio | 88 | 91 | 27 | 85 | 17 | 89 | 95 | 79 | 90 | 72 | 82 | 89 | 45 |
| Michigan | 37 | 94 | 24 | 90 | 15 | 93 | 98 | 84 | ...... | 83 | ...... | ...... | 61 |
| Indiana | 33 | 92 | 25 | 80 | 15 | 92 | 98 | 79 | 93 | 84 | 84 | 90 | 36 |
| Illinois | 38 | 92 | 26 | 90 | 17 | 92 | 91 | 77 | 80 | 81 | 81 | 88 | 52 |
| Wisconsin | 32 | 86 | 26 | 83 | 16 | 93 | 100 | 82 | 98 | 85 | ...... | 98 | 87 |
| Minnesota | 25 | 81 | 22 | 77 | 20 | 89 | 98 | 85 | ...... | 71 | ...... | 87 | 100 |
| Iowa | 34 | 91 | 26 | 76 | 18 | 86 | 100 | 80 | 89 | 78 | 85 | 89 | 78 |
| Missouri | 27 | 96 | 21 | 95 | 14 | 93 | 84 | 82 | 73 | 86 | 83 | 88 | 48 |
| Kansas | 32 | 89 | 22 | 86 | 15 | 92 | 52 | ...... | ...... | 67 | 78 | 82 | 55 |
| Nebraska | 22 | 76 | 18 | 84 | 14 | 90 | 73 | 83 | 90 | 56 | 83 | 92 | 50 |
| South Dakota | 22 | 82 | 14 | 78 | 11 | 88 | 90 | ...... | ...... | 76 | ...... | ...... | 86 |
| North Dakota | 10 | 69 | 8 | 66 | 5 | 66 | 56 | ...... | ...... | 53 | ...... | ...... | ... |
| Montana | 39 | 91 | 39 | 92 | ...... | .... | 29 | ...... | ...... | 77 | ...... | ...... | 104 |
| Wyoming | 34 | 90 | ...... | ... | ...... | .... | 84 | ...... | ...... | 76 | ...... | ...... | 95 |
| Colorado | 33 | 86 | 25 | 91 | 17 | 90 | 76 | ...... | ...... | 49 | 78 | ...... | 83 |
| New Mexico | 80 | 92 | 29 | 94 | ...... | ... | 64 | ...... | 70 | 39 | 73 | ...... | 83 |
| Arizona | ...... | ...... | ...... | ... | ...... | ... | ...... | ...... | ...... | ...... | 83 | ...... | 82 |
| Utah | 36 | 93 | 36 | 95 | 18 | 94 | 85 | ...... | ...... | 89 | ...... | ...... | 90 |
| Nevada | ...... | ...... | ...... | ... | ...... | ... | ...... | ...... | ...... | 96 | 100 | ...... | 48 |
| Idaho | 37 | 96 | 33 | 99 | ...... | .... | ...... | ...... | ...... | 87 | ...... | ...... | 92 |
| Washington | 34 | 90 | 33 | 94 | 16 | 97 | 87 | ...... | ...... | 76 | ...... | ...... | 88 |
| Oregon | 18 | 86 | 29 | 91 | 16 | 95 | 91 | 82 | ...... | 85 | 100 | ...... | 90 |
| California | 25 | 80 | 17 | 83 | 13 | 93 | 73 | ...... | ...... | 83 | 94 | ...... | 71 |
| Oklahoma | ...... | ...... | ...... | ... | ...... | ... | 72 | ...... | ...... | ...... | 88 | ...... | 71 |
| Indian Territory | ...... | ...... | ...... | ... | ...... | ... | ...... | ...... | ...... | ...... | 82 | ...... | 79 |
| The United States | 29.6 | 89.2 | 20.4 | 82.1 | 15.1 | 92.0 | 78 2 | 72.8 | ......... | 74.4 | ......... | ......... | ...... |

JOHN HYDE,
Statistician.

JAMES WILSON,
Secretary.

## *Condition of Farm Animals and Estimated Losses During the Year Ending March, 31, 1900.*

| States and Territories. | Horses. | | | Cattle. | | | | Sheep. | | | | Swine. | | Estimated Number of Breeding Sows Compared with April 1, 1899. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Estimated losses from disease. | | Condition. | Estimated Losses. | | | Condition. | Estimated Losses. | | | Condition. | Estimated Losses from Disease. | Condition. | |
| | | | | From Exposure. | From Disease. | From all causes. | | From Exposure. | From Disease. | From all causes. | | | | |
| | P C | No. | P C | P C | P C | No. | P C | P C | P C | No. | P C | P C | | P C |
| Maine | 1.3 | 1,427 | 98 | 0.1 | 1.2 | 4,115 | 99 | 0.2 | 2.5 | 6,859 | 98 | 1.3 | ... | 99 |
| N. Hampshire | 1.5 | 834 | 98 | .1 | 1.8 | 4,079 | 99 | .7 | 2.7 | 2,689 | 99 | 2.0 | ... | 99 |
| Vermont | 1.5 | 1,266 | 99 | .1 | 1.7 | 7,224 | 98 | .4 | 2.2 | 4,401 | 98 | 1.8 | ... | 98 |
| Massachusetts | 1.6 | 1,056 | 99 | 0 | 1.9 | 4,844 | 97 | .2 | 1.2 | 562 | 97 | 2.2 | ... | 96 |
| Rhode Island | 1.4 | 145 | 99 | 0 | 1.8 | 637 | 100 | 0 | 2.3 | 244 | 97 | 1.8 | ... | 99 |
| Connecticut | 1.8 | 794 | 100 | 0 | 1.5 | 3,161 | 100 | .3 | 1.6 | 604 | 100 | 1.7 | ... | 96 |
| New York | 2.1 | 12,406 | 95 | .5 | 2.4 | 59,732 | 97 | .6 | 2.6 | 27,077 | 98 | 2.0 | ... | 95 |
| New Jersey | 2.0 | 1,599 | 99 | .3 | 2.2 | 6,578 | 97 | .2 | 2.3 | 1,068 | 98 | 2.7 | ... | 99 |
| Pennsylvania | 1.7 | 9,515 | 98 | .7 | 2.1 | 41,836 | 98 | 1.2 | 3.3 | 36,645 | 97 | 2.5 | ... | 99 |
| Delaware | 2.8 | 873 | 96 | 2.0 | 2.5 | 2,612 | 96 | .6 | 2.2 | 353 | ...... | 5.7 | ... | 99 |
| Maryland | 1.8 | 2,357 | 96 | .6 | 1.7 | 5,921 | 95 | 1.0 | 2.5 | 4,836 | 95 | 3.7 | ... | 102 |
| Virginia | 2.1 | 4,962 | 97 | 1.2 | 1.9 | 17,592 | 96 | 2.2 | 2.8 | 18,846 | 95 | 4.5 | ... | 99 |
| North Carolina | 2.0 | 2,963 | 97 | 1.9 | 2.1 | 20,726 | 93 | 2.4 | 2.6 | 11,763 | 93 | 6.5 | ... | 96 |
| South Carolina | 2.8 | 1,913 | 96 | 2.9 | 2.3 | 13,531 | 91 | 5.5 | 2.6 | 4,959 | 90 | 7.3 | ... | 101 |
| Georgia | 3.3 | 3,628 | 100 | 3.8 | 2.2 | 39,969 | 92 | 4.3 | 2.6 | 23,292 | 95 | 9.4 | ... | 101 |
| Florida | 4.2 | 1,598 | ...... | 5.1 | 3.5 | 35,503 | ...... | 4.4 | 3.5 | 6,010 | ...... | 11.8 | ... | 93 |
| Alabama | 2.6 | 3,472 | 95 | 2.7 | 2.2 | 25,043 | 93 | 3.6 | 2.9 | 11,167 | 91 | 7.8 | ... | 98 |
| Mississippi | 2.6 | 5,291 | 85 | 1.9 | 2.3 | 21,748 | 90 | 2.6 | 2.5 | 11,003 | 80 | 5.4 | ... | 110 |
| Louisiana | 3.9 | 5,656 | ...... | 3.2 | 3.1 | 18,583 | ...... | 3.1 | 3.6 | 7,584 | ...... | 10.1 | ... | 90 |
| Texas | 2.2 | 21,764 | 95 | 2.3 | 2.3 | 232,132 | 96 | 2.0 | 2.1 | 99,085 | 98 | 3.9 | ... | 102 |
| Arkansas | 2.3 | 5,385 | 94 | 2.1 | 2.9 | 20,971 | 91 | 2.0 | 2.7 | 5,121 | 84 | 12.2 | ... | 93 |
| Tennessee | 3.1 | 9,550 | 89 | 3.1 | 2.8 | 31,048 | 88 | 3.1 | 3.2 | 15,860 | 90 | 9.2 | ... | 90 |
| West Virginia | 1.8 | 2,706 | ...... | 1.1 | 2.0 | 12,654 | ...... | 2.1 | 3.8 | 25,182 | ...... | 4.9 | ... | 98 |
| Kentucky | 2.3 | 8,072 | 91 | 1.8 | 2.1 | 21,038 | 89 | 2.8 | 3.6 | 35,189 | 90 | 8.1 | ... | 89 |
| Ohio | 1.2 | 7,685 | 97 | .6 | 1.2 | 26,200 | 95 | 1.1 | 1.9 | 85,191 | 96 | 4.6 | ... | 93 |
| Michigan | 1.5 | 6,187 | 95 | .4 | 1.5 | 15,234 | 96 | .6 | 2.9 | 48,617 | 93 | 2.9 | ... | 94 |
| Indiana | 1.7 | 9,813 | 97 | .6 | 1.5 | 25,934 | 97 | 1.4 | 3.1 | 30,506 | 94 | 6.9 | ... | 97 |
| Illinois | 2.1 | 20,648 | 99 | .9 | 1.6 | 58,106 | 100 | 1.0 | 2.4 | 21,682 | 94 | 6.8 | ... | 101 |
| Wisconsin | 1.6 | 6,688 | 98 | 1.1 | 1.3 | 38,365 | 98 | .6 | 1.9 | 18,616 | 97 | 3.1 | ... | 99 |
| Minnesota | 1.8 | 8,274 | 97 | .4 | 1.4 | 22,266 | 92 | .6 | 1.8 | 10,061 | 100 | 8.4 | ... | 95 |
| Iowa | 1.2 | 11,753 | 100 | .9 | 3.0 | 134,238 | 100 | 1.7 | 3.6 | 32,832 | 100 | 7.7 | ... | 100 |
| Missouri | 1.7 | 12,318 | 96 | 1.1 | 1.9 | 61,421 | 96 | 1.9 | 2.7 | 27,491 | 95 | 7.0 | ... | 94 |
| Kansas | 1.3 | 9,525 | 99 | .9 | 1.9 | 80,282 | 99 | .6 | 1.0 | 4,402 | 99 | 6.0 | ... | 97 |
| Nebraska | 1.5 | 9,882 | 97 | .9 | 2.0 | 63,997 | 99 | .9 | 1.0 | 6,120 | 99 | 7.4 | ... | 95 |
| South Dakota | 1.3 | 3,742 | 99 | 1.0 | 1.6 | 22,859 | 98 | .9 | 1.5 | 9,165 | 99 | 3.9 | ... | 107 |
| North Dakota | 1.3 | 2,345 | 100 | .7 | 1.7 | 10,353 | 100 | 1.4 | 1.7 | 11,598 | 100 | 2.2 | ... | 102 |
| Montana | 1.8 | 2,642 | ...... | 2.4 | 1.7 | 39,352 | ...... | 2.4 | 1.9 | 177,019 | ...... | .8 | ... | 98 |
| Wyoming | 1.4 | 991 | 100 | 1.2 | 1.1 | 17,200 | 100 | 1.1 | 1.0 | 59,644 | 105 | .3 | ... | 98 |
| Colorado | 1.7 | 2,477 | 98 | 2.0 | 2.6 | 51,309 | 97 | 1.7 | .9 | 56,819 | 98 | 1.7 | ... | 97 |
| New Mexico | 1.7 | 1,414 | ...... | 1.9 | 1.8 | 25,126 | ...... | 3.0 | 1.7 | 186,751 | ...... | .9 | ... | 102 |
| Arizona | 1.5 | 786 | ...... | 4.8 | 1.9 | 25,584 | ...... | .8 | 1.2 | 20,488 | ...... | .8 | ... | 89 |
| Utah | 1.8 | 1,291 | 100 | 2.4 | 1.8 | 14,115 | 100 | 2.6 | 2.0 | 109,066 | 105 | .9 | ... | 93 |
| Nevada | 2.7 | 1,136 | ...... | 1.5 | 1.7 | 7,618 | ...... | 4.2 | 2.7 | 45,386 | ...... | 4.7 | ... | 86 |
| Idaho | 1.5 | 1,917 | 105 | 2.0 | 1.7 | 14,724 | 110 | 1.3 | 1.8 | 82,422 | 110 | 1.5 | ... | 102 |
| Washington | 2.2 | 3,771 | 100 | 1.5 | 1.8 | 12,885 | 103 | 1.9 | 2.0 | 30,818 | 106 | 3.3 | ... | 96 |
| Oregon | 1.5 | 2,769 | 101 | 1.3 | 1.2 | 15,936 | 101 | 2.0 | 1.9 | 95,421 | 105 | 2.2 | ... | 119 |
| California | 2.1 | 6,756 | 100 | 2.0 | 1.6 | 32,895 | 100 | 1.9 | 2.8 | 94,071 | 100 | 2.8 | ... | 110 |
| Oklahoma | 1.6 | 805 | ...... | 1.9 | 1.2 | 10,043 | ...... | 1.0 | 1.0 | 662 | ...... | .5 | ... | 99 |
| Ind'n Territory | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ... | ...... |
| United States | 1.83 | 247,838 | 97.0 | 1.37 | 1.99 | 1,477,332 | 97.2 | 1.82 | 2.0 | 1,615,247 | 99.9 | ...... | ... | ...... |

**JAS. WILSON,**
*Secretary.*

**JOHN HYDE,**
*Statistician.*

# REPORT OF
# ORGANIZATIONS.

## STATE HORTICULTURAL SOCIETY.

### OFFICERS.

*R. C. Burkhart, President, Martinsburg, W. Va.*
*L. C. Corbett, Secretary, Morgantown, W. Va.*
*J. H. Crawford, Vice-President, Organ Cave, W. Va.*

The State Horticultural Society has held two regular annual meetings since the publication of the last Biennial Report of the Board of Agriculture.

According to precedent, established in former years, one of these meetings was held in the Capitol City during the session of the Legislature; the other at some point in the State where horticultural interests are developing, or where there is a possibility of awakening an interest along such lines. Accordingly, the meeting in the fall of 1899 was held at Lewisburg, Greenbrier County.

*The Charleston Meeting*, held in the month of February and during the session of the Legislature, while not largely attended, was one of the best meetings the Society ever held, judged according to the number and quality of the papers presented. It is hoped that at future meetings, held in Charleston, a larger local interest may be aroused, and that a more propitious time may be selected, so that a larger representation of the law-makers who are particularly interested in the promotion of horticulture in the State, may participate in the meetings. The meeting in Charleston once in two years should be planned for with this object in view.

People of all classes naturally gravitate to the city during a Legislative session, and our meetings should be so well advertised and the program so attractive that every one interested in the cultivation of a plant or a flower, will find it a pleasure to attend the session of the Society. The last Charleston meeting was an encouraging success, and stimulated us to renewed efforts.

*The Lewisburg Meeting*, which represents the off year meeting, was well attended, and an interesting discussion of local problems resulted. One unfortunate character prevailed in this meeting—the participants had not reduced their communications to writing; consequently, members not in attendance, and this is usually a large majority of the members of the society, were deprived of the privileges of the meeting. The distances to be covered and the expense of traveling, make it impossible for any considerable representation of the membership of the society to attend its meetings; hence the desirability of having all communications reduced to writing.

While the State Society reaches a larger number of people than any local organization can possibly hope to, yet the local society can control local problems that are at present out of the power and jurisdiction of the State society, both because of lack of authority and lack of funds. Some of our county societies have proven themselves equal to the problems before them and have accomplished most commendible results.

The Berkeley County Horticultural Society is a live organization, composed of up-to-date fruit growers. These men have become thoroughly convinced of the destructive power of the San Jose scale, which has become distributed in various orchards of the county. This pest has not only proven itself capable of living and multiplying under the climatic conditions of the county, but has persisted under the hand of the orchardists who intended to make a thorough job of its treatment. With these facts before the society, in connection with the fact that certain orchards were known to be seriously infested, and that the owner of the orchards, apparently not realizing their own loss and the menace to other orchardists, neglected to treat their trees. After securing from the owners of these infested orchards permission to treat them, two meetings of the society were held. The first was called early in February, 1900, the writer being the only guest present. At this meeting the problem in hand received a thorough discussion, not only from the standpoint of the danger which threatened every fruit grower in the region and the difficulty of the task, but ways and means for accomplishing the suppression of the pest were taken into account. After the discussion closed a subscription was taken and about $150.00 raised for the purchase of insecticides with which to treat the scale in infested orchards. The society determined to inaugurate a crusade against the scale in the county. The objects of this were two fold; first, public sentiment must be awakened in any movement of this sort in order to insure its success; second, the large growers manifested their interest in protecting their own possessions by contributing to the aid of others to rid their orchards of an enemy that they had unknowingly purchased with their nursery stock.

A committee was appointed to decide upon the materials to be used in the work. This committee consisted of the following gentlemen: G. P. Miller, I. W. Wood and Alex Clohan. After selecting Whale Oil Soap and Kerosene, Crude petroleum was added at my suggestion, the Experiment Station providing the material. After deciding upon the above outlined plan of attack, the writer was invited to superintend the work, which he did, and has since made several trips to the infested orchards for the purpose of studying the effect of the different sprays upon the growth, fruitfulness and general health of the treated trees, as well as the effect upon the scale.

A second meeting of the local society was held two weeks later, at which Dr. A. D. Hopkins, of the W. Va. Agriculture Experiment Station, W. G. Johnson, Gould and C. O. Townes of the Maryland Agriculture Experiment Station were present. Here again a lively interest was awakened on account of the distructiveness of the enemy and the difficulty of holding it in check. The conclusions which had been reached at the earlier meeting were enforced by this one, and what had before been a resolution became a determination, and, accordingly on the 28th of March, spraying was begun in one of the infested orchards. In response to the invitation of the Committee above named, the writer superintended the preparation and an application of Whale Oil Soap, pure and dilute Kerosene and pure and dilute Crude Petroleum.

The results of the work have proven very gratifying. Prejudice against the use of certain insecticides has disappeared, their value has been conclusively proven and the superiority of one treatment over that of another emphasized.

For assistance rendered in carrying out this work thanks are due to the Allegheny Orchard Company, Mr. W. S. Miller and to Mr. J. W. Null, representing the Gould Mfg. Co., of Lockport, N. Y., all of whom loaned pumps and other apparatus to facilitate the work. Interested growers came to assist, as well as to receive instruction. It is impossible to name all those who assisted in the work, but two persons, Mr. Chas. Miller and Mr. I. W. Woods, both interested in large orchard enterprises, each took charge of a division and assisted in carrying it to completion.

Results of the season strongly favor pure Kerosene and pure Crude Petroleum, with the balance of favor on the side of Crude Petroleum. Dilute sprays are not effective in badly infested localities, and any thing short of a most thorough application if the insecticides *to all infested parts* of the tree is time and money thrown away.

*Thorough and persistent treatment with Crude Oil will hold the scale in check without injury to the plant.*

The experiment and precautionary measure so extensively undertaken and so successfully carried out, should serve not only as a suggestion to other communities similarly threatened, but should prove an example for them to copy.

# THE WEST VIRGINIA WOOL GROWERS' AND SHEEP BREEDERS' ASSOCIATION.

## OFFICERS.

S. C. Gist, President, Wellsburg, W. Va.
J. J. Eckles. Vice President, Lewisburg, W. Va.
Jas. Beall, Secretary, Wellsburg, W. Va.

In presenting a report of this Association we give only a brief review of the proceedings of the two annual meetings held since October 1, 1898.

## SIXTH ANNUAL MEETING.

The Society convened in its sixth annual session in the lecture room of the M. E. Church, South, in Charleston, West Virginia, Wednesday, February 8th, 1899. Notwithstanding the coldest weather on record was prevailing at this time, there was a pretty fair attendance of representative men from the different parts of the State. Promptly at ten o'clock a. m., President S. C. Gist called the meeting to order. Hon. J M. Sydenstricker led in prayer. After some preliminary business, M. V. Brown, of Buffalo, read one of his characteristic good papers on "The Sheep Industry in West Virginia;" among many other interesting points which he brought out, he said it cost three dollars to raise a good sheep to a year's age. C. L. Eakin, of Wadestown, who could not be present, sent a paper, which was read by the Secretary, on the subject: "What Can We Do Toward Controlling the Sex?" Hon. Jas. H. Stewart; of Morgantown, made a talk on "Some Feeding and Other Experiments," which gave those present some idea to what extent investigation is being carried on, and what great discoveries are being made for the benefit of our husbandmen. Prof. T. C. Atkeson, of Morgantown; made one of his best talks, and this is sufficient to say—for all who have had the pleasure of hearing the professor know that it was certainly directly to the point, and contained food for the intellect on the subject of "How Can We Best Improve and Protect Our Flocks?" The President, in the course of his address, read postal answers to questions which he had previously sent out, from persons living in thirty-six different counties in the State, regarding the "Sheep Industry."

These answers gave much valuable information concerning the number, quality, etc., in each county. C. C. Brown supplemented the President's statistics, giving the estimated total number and value of sheep in the State at 785,700 head, valued at $2,802,400. Harrison and Marshall counties led all the others with 50,000 head each; Monongalia second, with 40,000 head. Hon. S. W. Atkinson read a short but very interesting paper on "Comparative Profits of Sheep and Other Farm Animals." A committee was appointed to draft a bill to be presented to the Legislature then in session, to ask for the enactment of a law to protect sheep from the ravages of dogs. This bill was thoroughly discussed, every sheep man present giving his experience with dogs. One member remarked that he never put out poison; that it was always against his better nature, but that he was compelled to use it or go out of the sheep business. Other subjects were discussed during the day, and several resolutions were adopted.

## SEVENTH ANNUAL MEETING.

This meeting was held at Lewisburg, October 18, 1899, in connection with the State Horticultural Society and the State Grange. The meeting was called to order by Pres. S. C. Gist, and opened with prayer by Rev. Hutchinson. Senator Arbuckle, in a very neat and appropriate speech, welcomed the members and delegates of the Association. The President responded on behalf of the Association.

"The Most Profitable Sheep for This Section of West Virginia," was the subject of an address by the Hon. J. M. Sydenstricker. Among other things he said: The Marino sheep had not been sufficiently tested in this section of the State to know how they would become adapted to the climate. The South Downs, a fine mutton sheep, had been crossed with native sheep with very good results. He stated that he had been over many sections of the State, but on account of natural advantages Greenbrier County can hardly be excelled.

There were handled in the county no less than twenty to twenty-five thousand sheep annually, but as to sheep husbandry they had not had as much experience as in cattle growing. He is confident, however, that if the same attention and care were bestowed on sheep husbandry as is given to cattle in this section at least 75 per cent. could be realized. Sheep have been raised for mutton, not for wool, but wool should be given more attention. In this climate sheep do not have to be housed all winter, which is certainly a great advantage.

As a part of our profession we should be more thoroughly acquainted and skilled in the art of husbandry.

We as husbandmen ought to come together and consider these questions of so great importance to us. It is one of the oldest pursuits of man, even back through the ages of Adam's son Abel, who tended the flock. As it is an inheritance handed down to us from time immemorial, we should see to it that we magnify our calling.

## DISCUSSION.

J. H. Crawford: Experience has proven that the Cuspids are not profitable. The coarse-wooled sheep and Marinos thus far have been troubled with sore feet.

Shropshires have proven to be very healthy and profitable. In his opinion the best sheep that have been raised in this section of the country is a cross between the Shropshire and Marino.

Mr. Ludington said his experience began by breeding the wrinkled Marino that came from Washington county, Pennsylvania.

A cross between the Marino and South Down has done very well. He has not seen the time in fifteen years when he could not about double his profits in sheep.

J. D. Arbuckle said the Marinos first lifted him out of the pit. He had been handling some of the Downs, and they have been a most excellent sheep for this section. A Dorset ram crossed with the Shropshire has been very satisfactory. Would not advise breeding twice a year.

Mr. McLaughlin: In my experience the Hampshire Downs is the best sheep up to the present time for this section; had lately purchased a few Hampshire Downs, and is favorably impressed with them. The best for this section is a close-wooled sheep. It affords protection in case of cold rains and sleet. He considers that $1 more profit can be made from Down ewes, as the lambs will weigh 20 pounds more, besides securing an increased amount of wool. It is of the utmost importance in breeding Downs to have a good sire, such as will give his impress on the lambs. It is very essential to become thoroughly acquainted with the flock and breed with the greatest care, in order to secure the best profit. He thinks he can count on $5 profit per head from a good flock of ewes.

Dr. Wm. H. McClung: It has been just 30 years since I commenced in the sheep business. Have tried Marinos, Cotswool and Lincoln with varied results. I secured the Shropshire and South Downs and was better pleased. I think they are the sheep for this section of the country. They are close-wooled and so far have had no foot rot. I cannot raise sheep by keeping too many together, and cannot keep a flock too long in the same quarters without disease. The ewes usually run out on the sod most of the winter and get very little grain. Have always practiced keeping the finest and best ewes and sell the culls, but sell no others.

One of the first things to do is to keep the sheep healthy. Second, to breed carefully. Third, to know how to sell.

One rule of success is to change the sheep often and not keep too many, and do not have lambs come too early. The wool about pays for the cost of keeping; the profit is in the lambs and mutton. The sheep should be kept dry to be healthy, but kept out of doors as much as possible, and they will be healthy and able to throw off disease.

It has cost $55 to keep 100 ewes per year. Ewes will last as breeders about eight years. Sheep will not do well in high grass; the pasture must be growing, green and succulent for sheep to thrive and do well. Following is a statement of the yearly profits in 100 ewes. Cost of keeping and profits derived from 100 ewes within twelve months—Feed and attention, clipping, etc., $155:

| | |
|---|---|
| Wool | $120 |
| 100 Lambs | 350 |
| Total | $470 |
| Feed, etc | 155 |
| Clear profit | 315 |

on an investment of $400, price paid for 100 ewes, which are still on hand. These ewes can be bred until they are 8 years old.

| | |
|---|---|
| The clear gain | $315.00 |
| At 8 per cent | .08 |
| | $2,520.00 |

At this ratio of profit in 8 years an investment of $400 yields $2,520.

This estimate is made below actual profits, so as to cover reasonable loss by death from dogs, accidents and disease.

The noon hour having arrived it was decided to appoint a committee to elect officers for the coming year.

On motion the following committee was appointed to report at the afternoon session: M. A. McLaughlin, M. A. Jackson and W. R. Dodson, Adjourned to meet at 1:30 p. m.

### AFTERNOON SESSION.

Meeting was called to order at 1:30 p. m. It was decided that the report of committee on election of officers would be first in order.

Committee reported the re-election of the officers who had served the past year as follows: For President, S. C. Gist, Wellsburg; Vice-President, J. J. Echols, Lewisburg; Secretary, James Beall, Wellsburg, W. Va.

Report was accepted.

The regular program of proceeding was then taken up.

The subject of "Parasites" came next in the order of discussion. Prof. J. H. Stewart, Director of the Experiment Station, was the first speaker. He considered the main thing in regard to parasites was a preventative. Some things to consider in undertaking to prevent it are: To keep the sheep in a healthy condition. Do not select and sell the best, but breed from healthy individual animals. As a remedy gasoline has proved a success. As a preventative use at intervals through the spring and summer one part oil to two parts milk; take tablespoonful for a dose. Keep the mixture well stirred.

In answer to the question as to the best section of the country for sheep, says he has traveled extensively, and his observation has been that no section of the country will equal the Northern Panhandle, and some of the country adjacent to it, for producing the finest wool known.

Question—As to best treatment for parasites?

Gasoline treatment considered good.

Carbon oil injected into the nose has proved beneficial.

Dr. Wm. H. McClung: The remedy for the red louse parasite which accumulate on sheep by the thousand; get tobacco and boil to a strong liquid, and dip the sheep. It will also destroy ticks.

He dips his sheep in a liquid composed of 4 gallons of sulphur to 40 gallons of the tobacco juice.

He considers the troublesome parasite in sheeps feet were deposited by an insect, when the sheep are seen stamping and running as if to evade something.

For internal parasites, it is best to admisister remedies when the stomach is empty. For lambs he administers ½ teaspoonful of gasoline to one of new milk, keeping the mixture well stirred.

The best treatment for scab is a preparation of tobacco juice.

A. R. Jacob, of Ohio county, was called on and discussed the fine wool Merinos, which he breeds quite extensively, and to which his section of the country is peculiarly adapted. He spoke of crossing the Saxony with other smooth Merino breeds, and from his observation and experience, the smooth Merinos are adapted for running in large flocks, and are a profitable sheep. They are undoubtedly the sheep for a large range or ranch.

A very excellent paper was read by J. A. Ewart, on the subject, "Sheep in Southern West Virginia." Some of the points brought out by Mr. Ewart, was the adaptability of the soil and climate.

The counties composing the section of the country referred to, are well calculated to raise and maintain as vigorous a race of sheep as anywhere in the world. The section is well watered and adapted to blue grass and the clovers.

He gave the profits from 15 ewes of his flock for the year past as follows: We clipped 60 pounds of wool from them, which at the market price of 32 cents amount to $19.20. They produced 18 lambs, which we were offered $5.00 per head for, or $90.00 for the lot, making a total of $109.20, or $7.28 per head. In addition to this they kept the brush down in the fence corners in a wood lot, which was well worth $5.00 to us. The expense of keeping them could not have exceeded $2.50 per head. What other farm industry would have made a showing like this for the amount invested.

"The Making and Marketing of Mutton Lambs," was the subject of an address by B. F. Mann, Fort Spring. He advised having the lambs come from February 1st, to April; and feed a little bran until June or July, at which time they are sold at from 4¾ to 5 cents.

We think the above rule a good one, and would advise a little oats and corn mixed with the bran to keep them growing and thriving. The worm will usually hunt a weaker flock to prey upon. The Greenbrier county flock masters have, as the Berkeley county shepherds, made a success in raising and marketing mutton lambs.

Their flocks, however, are small compared with their large farms and excellent blue grass pastures. Since the increased price of wool, these farms that have large range could certainly do well, and add considerably to their present profits by keeping more sheep.

The Lewisburg meeting was exceptionally pleasant, as well as profitable to all who attended.

The many courtesies extended by the generous people of the town and vicinity, made the occasion one of the most agreeable it has been our fortune to attend. The entire meeting from beginning to end was said to be one of the most interesting the Association has ever held.

# THE WEST VIRGINIA STATE GRANGE
OF THE
# PATRONS OF HUSBANDRY.

## THE WEST VIRGINIA STATE GRANGE

OF THE

## PATRONS OF HUSBANDRY.

### PRESENT OFFICERS.

| | | |
|---|---|---|
| Master | T. C. Atkeson | Morgantown. |
| Overseer | D. W. Skinner | Pliny. |
| Lecturer | James George | Ashton. |
| Steward | Geo. H. Sperow | Martinsburg. |
| Assistant Steward | Geo. H. Lewis | Savannah. |
| Chaplain | J. M. Rine | Wells |
| Treasurer | C. T. Perry | Cuba. |
| Secretary | M. V. Brown | Buffalo. |
| Gate Keeper | J. M. Hartley | Extra. |
| Ceres | Mrs. T. C. Atkeson | Morgantown. |
| Pomona | Miss S. O. Couchman | Martinsburg. |
| Flora | Miss Jennie Bonar | Wells. |
| Lady Ass't Steward | Miss Nannie B. Small | Martinsburg. |

### EXECUTIVE COMMITTEE.

| | |
|---|---|
| S. H. McNeil, *Chairman* | Mercer's Bottom. |
| M. A. Jackson | Lewisburg. |
| S. C. Gist | Wellsburg. |

National and State Organizer...C. C. Brown...............Buffalo.

Thirty-three years ago, farmers' fraternal organization then named, and yet known, as the "Patrons of Husbandry," unfurled its banner to the breeze, bearing the motto, *Esto Perpetua*—let it be perpetual—and in Faith, Hope and Charity, and with Fidelity, that banner has been carried onward and upward by the patriotic and home loving farmers of this country.

The organization was perfected on December 4th, 1867, since which time more than 3,000,000 persons—farmers, with their wives, daughters and sons have been duly initiated into the order, and on the 11th day of February, 1874, the following "Declaration of Purposes" was unanimously adopted by the National Grange and promulgated to the world.

## DECLARATION OF PURPOSES OF THE PATRONS OF HUSBANDRY.

### PREAMBLE.

Profoundly impressed with the truth that the National Grange of the United States should definitely proclaim to the world its general objects, we hereby unanimously make this Declaration of Purposes of the Patrons of Husbandry:

### GENERAL OBJECTS.

1. United by the strong and faithful tie of Agriculture, we mutually resolve to labor for the good of our Order, our country, and mankind.

2. We heartily endorse the motto: "In essentials, unity; in non-essentials, liberty; in all things, charity."

3. We shall endeavor to advance our cause by laboring to accomplish the following objects:

To develop a better and higher manhood and womanhood among ourselves. To enhance the comforts and attractions of our homes, and strengthen our attachments to our pursuits. To foster mutual understanding and co-operation. To maintain inviolate our laws, and to emulate each other in labor, to hasten the good time coming. To reduce our expenses, both individual and corporate. To buy less and produce more, in order to make our farms self-sustaining. To diversify our crops, and crop no more than we can cultivate. To condense the weight of our exports, selling less in the bushel and more on hoof and in fleece; less in lint, and more in warp and woof. To systematize our work, and calculate intelligently on probabilities. To discountenance the credit system, the mortgage system, the fashion system, and every other system tending to prodigality and bankruptcy.

We propse meeting together, talking together, working together, buying together, selling together, and, in general, acting together for our mutual protection and advancement, as occasion may require. We shall avoid litigation as much as possible by arbitration in the Grange. We shall constantly strive to secure entire harmony, good will, vital Brotherhood among ourselves, and to make our order perpetual. We shall earnestly endeavor to suppress personal, local, sectional, and nationa prejudices, all unhealthy rivalry, all selfish ambition. Faithful adherence to these principles will insure our mental, moral, social, and material advancement.

### BUSINESS RELATIONS.

4. For our business interests, we desire to bring producers and consumers, farmers and manufacturers, into the most direct and friendly relations possible. Hence we must dispense with a surplus of middle men, nor that we are unfriendly to them, but we do not need them. Their surplus and their exactions diminish our profits.

We wage no aggressive warfare against any other interests whatever. On the contrary, all our acts and all our efforts, so far as business is concerned, are not only for the benefit of the producer and consumer, but also for all other interests that tend to bring these two parties into speedy and economical contact. Hence we hold that transportation companies of every kind are necessary to our success, that their interests are intimately connected with our interests, and harmonious action is mutually advantageous, keeping in view the first sentence in our Declaration of Principles of action, that "Individual happiness depends upon general prosperity."

We shall, therefore, advocate for every state the increase in every practical way, of all facilities for transporting cheaply to the seaboard, or between home producers and consumers, all the productions of our country. We adopt it as our fixed purpose to "open out the channels in nature's great arteries, that the life blood of commerce may flow freely."

We are not enemies of railroads, navigable and irrigating canals, nor any corporation that will advance our industrial interests, nor of any laboring classes.

In our noble Order there no communism, nor agrarianism.

We are opposed to such spirit and management of any corporation or enterprise as tends to oppress the people and rob them of their just profits. We are not enemies to capital, but we oppose tyranny of monopolies. We long to see the antagonism between capital and labor removed by common consent, and by an enlightened statesmanship worthy of the nineteenth century. We are opposed to excessive salaries, high rates of interest and exhorbitant per cent. profits in trade. They greatly increase our burdens, and do not bear a proper proportion to the profits of producers. We desire only self-protection, and the protection of every true interest of our land, by legitimate transactions, legitimate trade, legitimate profits.

### EDUCATION.

We shall advance the cause of education among ourselves, and for our children, by all just means within our power. We especially advocate for our agricultural and industrial colleges that practical agriculture, domestic science, and all the arts which adorn the home, be taught in their courses of study.

### THE GRANGE NOT PARTISAN.

5. We emphatically and sincerely assert the oft-repeated truth taught in our orgnic law, that the Grange—National, State or Subordinate—is not a political or party organization. No Grange, if true to its obligations, can discuss partisan or sectarian questions, nor call political conventions, nor nominate candidates, nor even discuss their merits in its meetings.

Yet the principles we teach underlie all true politics, all true statesmanship, and if properly carried out, will tend to purify the whole political atmosphere of our country. For we seek the greatest good to the greatest number.

We must always bear in mind that no one, by becoming a Patron of Husbandry, gives up that inalienable right and duty which belongs to every American citizen, to take a proper interest in the politics of his country.

On the contrary, it is right for every member to do all in his power legitimately to influence for good the action of any political party to which he belongs. It is his duty to do all he can in his own party to put down bribery, corruption and trickery; to see that none but competent, faithful and honest men, who will unflinchingly stand by our interests, are nominated for all positions of trust; and to have carried out the principle which should always characterize every Patron, that

### THE OFFICE SHOULD SEEK THE MAN, AND NOT THE MAN THE OFFICE.

We acknowledge the broad principle that difference of opinion is no crime, and hold that "progress toward truth is made by difference of opinion," while "the fault lies in bitterness of controversy."

We desire a proper equality, equity, and fairness; protection for the weak, restraint upon the strong, in short, justly distributed burdens and justly distributed power. These are American ideas, the very essence of American independence, and to advocate to the contrary is unworthy of the sons and daughters of the American Republic.

We cherish the belief that sectionalism is, and of a right should be, dead and buried with the past. Our work is for the present and future. In our agricultural brotherhood and its purposes, we shall recognize no North, no South, no East, no West.

It is reserved by every Patron, as the right of a freeman, to affiliate with any party that will best carry out his principles.

### OUTSIDE CO-OPERATION.

6. Our being peculiarly a farmers' institution, we cannot admit all to our ranks.

Many are excluded by the nature of our organization, not because they are professional men, or artisans, or laborers, but because they have not a sufficient direct interest in tilling the soil, or may have some interest in conflict with our purposes. But we appeal to all good citizens for their cordial co-operation to assist in our efforts towards reform, that we may eventually remove from our midst the last vestige of tyranny and corruption.

We hail the general desire for fraternal harmony, equitable compromises, and earnest co-operation, as an omen of our future success.

### CONCLUSION.

7. It shall be an abiding principle with us to relieve any of our oppressed and suffering brotherhood by any means at our command.

Last, but not least, we proclaim it among our purposes to inculcate a proper appreciation of the abilities and sphere of woman, as is indicated by admitting her to membership and position in our Order.

Imploring the continued assistance of our Divine Master to guide us in our work, we here pledge ourselves to faithful and harmonious labor for all future time, to return by our united efforts to the wisdom, justice, fraternity, and political purity of our forefathers.

How nobly the Order has lived up to this patriotic "Declaration of Purposes," those who have followed its history will most heartily and cheerfully attest.

The Legislative Committee of the National Grange has been active and earnest, as well as influential in promoting the interests of American agriculture, and in the enactment of just and equitable laws. Among many other measures which it has championed with more or less success might be mentioned the establishment and extension of "rural free mail delivery," and anti-trust laws, which would prevent unjust and unwarranted impositions upon the people in general, and the agricultural people in particular.

It has also stood for the establishment of Postal Savings Banks, under proper safeguards and governmental control, and pure food laws for the protection of producers against all imitation products, and especially for the protection of all consumers against the many absolutely harmful and injurious imitations and adulterated products which are placed upon the markets, and sold for something, which in reality they are not.

The completion of the Nicaragua Canal by the United States has been honestly and manfully advocated, and for such additional powers conferred upon the Interstate Commerce Commission as will enable it to carry into practical effect the original purposes of the measure, have been endorsed by the order and championed by its legislative committee at the National Capitol.

Believing that "all Governments derive their just power from the governed," the same committee, with the sanction and support of the whole national order has strongly advocated the election of United States Senators by popular vote, and give many good reasons for believing that such a system would be a great improvement over the present mode, and give the American patriot and statesman, at least an even chance with the millionaire, who in some cases have been successful, without regard to qualifications or fitness. The order, through its committee, have favored laws regulating the use of shoddy, and for laws giving states authority to legislate in regard to the sale of imitation dairy or other products.

The order has placed itself on record as against the irrigation of arid lands by the government, and favoring laws prohibiting future contracts of a fictitious nature in the products of the farm.

The National Grange has placed its seal of condemnation on the ship-subsidy bill.

"At the last session of the National Grange at Springfield, O., the following resolution was unanimously adopted upon ship subsidies:

"*Resolved*, That while this National Grange does most heartily desire the upbuilding of our merchant marine, we are emphatically opposed to the principles of subsidies, and believe the desired results can and will be accomplished without resorting thereto."

The Worthy Lecturer, Bro. Alpha Messer, made the following address in support of the resolution:

### ADDRESS OF BRO. ALPHA MESSER.

I am unable to see what advantage the farmers will receive from the government subsidy if the proposed shipping bill should become a law. While I am an American citizen, "to the manor born," I am still a farmer, and I find it just as necessary for farmers as a class to look out for their interests as it is for the ship builders to look out for theirs, regardless of any sentiment in the matter.

It is possible that more ships may mean lower ocean freight rates, but if lower ocean freight rates should be the result, would the farmers be benefited thereby? The proposed subsidy would mean a tax of not less than one hundred and forty millions of dollars on the industries of the people during the next twenty years. Mr. Alexander R. Smith, who appeared before this body last week in support of the subsidy, claims that this estimate is much too large. In a recent speech of Senator Frye of Maine, in favor of this subsidy, he said that the provisions of the bill call for from five to nine millions a year. Now, if the appropriations are to continue for twenty years, as stated in the bill, my estimate is too small, and the sum may reach nearly two hundred millions. No definite sum is stated in the bill. The proposed appropriation is based on tonnage and miles, with a bounty of one dollar a month to sailors who are American citizens.

If a bounty is to be paid to young American citizens to induce them to become sailors, why not pay a bounty to the young men of the nation to induce them to enlist under the banner of agriculture, for the purpose of inducing them to become expert farmers and American citizens in the truest sense of the word? The argument of Mr. Smith that a subsidized American merchant marine would train American sailors to defend American interests in case of war, loses its force when the provisions of the bill are such as to call for only one-fourth of American seamen, and in sailing from foreign ports an entire foreign crew can be enlisted for sailing the ship. It may be said that Mr. Smith's resolution does not ask for an indorsement of the proposed bill, which is true, but it does ask for an indorsement of the principle of subsidies, which is the foundation of the bill. The resolution of Mr. Smith was adroitly drawn, and if adopted it would place the National Grange on record as favoring government subsidies, and if rejected it would place this body on record as opposed to the merchant marine. The substitute presented by the committee enables the Grange to oppose the principle of subsidies embodied in the original resolution, without opposing the expansion of our merchant marine.

Mr. Smith says that farmers are taxed on less than one-fourth of the total wealth of the country, and they would therefore contribute less than one-fourth of the compensation paid out. From census returns I find that the farmers possess considerably more instead of less than one-fourth of the wealth of the United States, and it is universally conceded that farmers pay a very much larger amount of taxes in proportion to their wealth than any other class in society, and consequently they will in various ways be taxed to pay a large proportion of the proposed subsidy. In other words, in addition to the freight, they will be required to pay an additional tax for the privilege of having their export products carried in American subsidized ships. Aside from the principle involved, if farmers were sure of compensating advantages in the reduction of freight rates between the farm and the foreign consumer, there could be no objection to the subsidy. But such assurances are not and cannot be given. In 1873 it cost 21.12 cents to ship a bushel of wheat from New York to Liverpool, and in 1895 it cost 3.9 cents for the same service. The total reduction in wheat freight from Chicago to Liverpool from 1873 to 1895 by all-water route, was over 40 cents per bushel. I suppose that the rate today is somewhat higher than in 1895, owing to existing temporary abnormal conditions. During this time the price of wheat and other exporting farm products has fluctuated back and forth, but ocean rates of freight have steadily declined. Yet no one would presume to say that the great reduction in these sales, or any considerable portion of it, has been added to the price of wheat, corn, and other exporting farm products.

If ocean rates of freight should be reduced by reason of government subsidies, the present policy of the trunk lines of railroads would preclude any advantage which might accrue to farmers from such a reduction. Through combination competition is destroyed, and the freight rate charged is "all that the traffic will bear."

Only a few days since railway freights on trunk lines were advanced nearly twenty-five per cent., in the face of the fact that railway earnings of the past year have been almost, if not quite, unprecedented in favor of the roads. Under such conditions farmers can receive no advantage from a reduction of ocean freights should such be the result of the proposed subsidy.

A few weeks since a prominent shipping man, when asked about the preparation for increasing the merchant marine, said: "The American merchant marine offers today the best outlet for idle capital that can be found, and the possessors of large amounts of capital are beginning to realize this." This shows that under existing conditions shipping profits are greater than in most other lines of investment, and if the proposed subsidy is obtained these profits will be largely increased.

It looks to me as if the proposition for heavily subsidizing our merchant marine was a scheme to largely increase the wealth of the few at the expense of the many. The Grange is opposed to any such action by Congress.

In what does the prestige and glory of our nation consist? Is it in colossal fortunes and great combinations of wealth? No! A thousand times, *No!* Its greatness, power, and civilizing influences among the nations of the world lie in the general intelligence and patriotism of its people, in its agricultural resources and its agricultural population. These and these only are the true sources of the nation's prosperity, progress, influence, and high standing at the present time.

The West Virginia State Grange, with all of its District and Subordinate Granges, has been a strong, ardent and loyal supporter of the great national order in all of its past achievements, as well as in the matters which are now demanding and receiving its earnest and systematic work.

Besides the support given the National order the State Grange has been quite as earnest and active in promoting the interests of agriculture within its own jurisdiction.

Within the past two years the order in this State has made considerable progress, and is at this time in excellent working condition, and in good standing and favor among the people, especially among the more thoughtful and hopeful of our rural population.

The work which is being done is of the permanent and lasting kind, and the formation now under the order in this State is upon the solid rock of patriotism, character and determination, and not upon the changing and shifting sands of time. Upon these unmistakable signs we build our hope, and look forward with confidence to the future.

The State, like the National Grange, has not confined its labors to one line of work to the neglect or exclusion of the others.

Along the line of educational and social work, the order has not been idle, but has accomplished much which cannot be written here.

Our College of Ariculture, at Morgantown, the Dean of which is our State Master, is a monument to Grange effort and achievement.

Our aggressive State Board of Agriculture, which has done and is still doing so much for the agricultural interests of the State, came to us as the result of Grange activity and effort.

The Legislative Committee has been able to accomplish much for the farmers, and are not blind to the fact that much yet remains to be done.

In its co-operation and business relations the Grange has been conservative and cautious in the past few years, and yet, without injury to the business interests of other people, it has greatly benefitted and helped its members.

One of its latest business enterprises has been undertaken by District Grange No. 8, and is along the line of Mutual Fire Insurance, for the protection of its members from loss by fire and lightning. This Company is so far advanced that a Constitution and By-Laws have already been adopted, and the temporary officers have been elected.

The plan, Constitution, etc., are as follows:

# THE PATRONS

# Mutual Fire Insurance Company

## OF WEST VIRGINIA.

For Isolated Property of Patrons only.
No Loss; no Expense.
Fair and honorable adjustment of all losses by brother patrons who are familiar with the property lost or damaged.
No fine offices or high salaried officers to support.
Many such companies in successful operation in other states.

J. H. COLLINS, President.
M. V. BROWN, Secretary-Treasurer.

BUFFALO, W. VA.

### THE PLAN.

The plan of insurance is based upon honor and embraces the great principle, "Bear ye one another's burden," which principle has been so successfully built upon in other States, and which is one of the fundamental principles of the Grange of the Patrons of Husbandry in the United States of America and in Canada.

We propose to use our own brains and our own money and thus secure to our membership safe insurance at the lowest possible cost.

Each member of the company is to pay an entrance fee of 25 cents on each $100 of property insured, thus securing a perpetual policy which is assessed only in case of loss to his unfortunate brother in proportion to the amount of insurance carried by each member which in no case can be very much, as this Company limits the risk to $2,000 on any one building. In similar companies, the assessments have generally been very low.

For ten years preceding the last census, the average cost on $1,000 per annum was only 23 cents in the "Fulton Farmers' Mutual Aid Association," of Ohio. In the "Farmers' Mutual Fire, Drake County," Ohio, for the same period, 50 cents on the $,1000 of insurance. For the same period in the "Southern Washtenaw Farmers' Mutual," Michigan, 90 cents on the $1,000 of insurance. In the "Washington County Mutual Fire," of Ohio, $1.09 on the $1,000 of insured property. In the "Farmers' Mutual Fire of Saganaw County," Michigan, the average cost for the ten years under consideration the assessment on the $1,000 insurance was $1.10.

To add the many other successes in this line of insurance is unnecessary to convince any fair-minded person of the feasibility and practicability of the plan.

Some of the advantages of the co-operative, or mutual, plan are: It costs but a trifle to run them, as there are no expensive offices to maintain; no high salaried officers to pay; no taxes to pay; have perpetual policies; no renewals to pay for. These policies are written to protect the insured, while others are written to protect the company. Or, in other words, while the stock companies are doing business for profit, this and similar companies are doing business for protection.

You choose your own officers from among your own brothers and sisters, of known ability and integrity, whose interests are your interests, and who will guard them accordingly.

By this plan, instead of paying for the protection you expect to get and seldom realize, you simply pay for protection you have already enjoyed. Your policy by this plan is a contract with two sides to it, which any one may read, and reading undestand. Few understand the policy of a stock company, which is written by and for the company, and against you.

When a loss occurs to a member of this company, your brothers who are men of integrity and like interests with yourself, adjust your loss or damage, while in stock companies a paid attorney, whose duty it is to make the best possible terms for his employers, adjusts your loss or damage.

Which plan of adjustment do you prefer? In stock companies difficulties are usually settled by courts—an expensive luxury. In this, and in companies operated on this general plan, we settle all differences by arbitration. If you believe in the honesty of men of your own choosing this is the company for you. If you believe all men to be dishonest and untrustworthy this is not the company you seek.

# CONSTITUTION.

## ARTICLE I.

### NAME.

This Company shall be known as the "Patrons' Mutual Fire Insurance Company" of West Virginia.

## ARTICLE II.

### OBJECTS.

The object of this Company shall be to insure farm buildings, with or without their contents against loss by fire and lightning.

## ARTICLE III.

### MEMBERSHIP.

Any Patron whose Subordinate Grange is a member of District Grange No. 8, and who is in good standing in his or her Subordinate Grange, may become a member and be entitled to attend all meetings of its members and vote at all elections by insuring his or her property in the Company and subscribing to its Constitution and By-Laws.

## ARTICLE IV.

### OFFICERS.

The officers of this Company shall be members of the Company, and shall consist of a President, Vice-President and Secretary, who may be Treasurer, and a Board of Directors.

## ARTICLE V.

### PRESIDENT, DUTIES OF.

It shall be the duty of the President to preside at all meetings of the Company and Board of Directors, to keep order, to decide all questions of order, to sign all policies issued by the Company, and all orders on the Treasurer, and to have general supervision over all matters pertaining to the welfare of the Company. In the absence or inability of the President, the Vice-President shall discharge all the duties of the President.

## ARTICLE VI.

### SECRETARY, DUTIES OF.

It shall be the duty of the Secretary to receive and lay before the Executive Committee all applications for insurance, to write out policies for all approved applications, to keep a faithful and true record of all the transactions and proceedings of the Company to report to the President whenever called on to do so; he is empowered to purchase stamps and stationary for the use of his office, have necessary printing done, make such reports as may be required of him by all proper authorities, make out and mail all notices of assessments to all members when losses occur, and sign all policies of insurance issued by the Company.

It shall be his duty as Treasurer, to collect all money due the Company, to disburse the same by order of the President, to report to the President when called on to do so, to care for all funds, bonds, notes and other evidences of indebtedness to the Company, to make reports to the Executive Committee when called on to do so, and at each Annual meeting make a full and complete report of the financial condition of the Company.

## ARTICLE VII.

### BOARD OF DIRECTORS—DUTIES OF.

It shall be the duty of the Board of Directors to elect one of its number President of the Company; to elect two of their number who, with the President, shall constitute the Executive Committee.

The duties of the Executive Committee shall be to pass upon all applications for insurance, provide for the adjustment of all losses, order all assessments, appoint all agents and inspectors and instruct them as to their duties.

## ARTICLE VIII.

### ANNUAL MEETING.

The annual meeting of the Company shall be held on the third Tuesday in January All elections shall be held at the annual meetings, a majority of the members present being necessary to a choice.

At the annual meeting there shall be elected a Board of nine Directors, three of whom shall be elected for three years, and three for two years, and three for one year, and annually thereafter there shall be elected three members for a term of three years.

The members present at an annual meeting shall constitute a quorum for the transaction of business.

The Secretary shall give notice of time and place of the annual meeting to all the members of the Company by mail at least ten days previous to the date of the meeting.

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## BY-LAWS.

### ARTICLE I.

Sec. 1. Patrons desiring to insure in this Company shall make application in writing to the Secretary, accompanied by their premium obligation, which shall be four times the amount of entrance fee, or $1.00 on each $100, which is to bear interest at the rate of 3 per cent. per annum, payable January 1st of each year, together with an entrance fee of 25 cents on each $100 of insurance asked for, and a description of the property to be insured, said premium obligation to be held by the company and not to be paid unless the insured default in the payment of assessments made as provided in Section 7 of this Article.

Sec. 2. This Company will take no risk on any one building for more than $2,000 nor on any one dwelling house situated nearer than 200 feet from another dwelling, and no policy shall be written for an amount greater than three-fourths of the actual cash value of the property insured.

Sec. 3. This Company will not insure encumbered property for more than two-thirds of its actual cash value. In case of loss or damage to such property this Company will make no payment until fully instructed as to the party to whom the money is legally due.

Sec. 4. If any member of this Company meet with or sustain a partial loss by fire or lightning, the Company shall be liable for the actual loss, provided the loss does not exceed the face of the policy.

Sec. 5. This Company shall not be required to pay the amount for any loss by fire or lightning in less than 60 days after the assessment has been made by the Company, which shall be made within ten days after the adjustment of the loss.

Sec. 6. Should the loser refuse to accept or subscribe to the adjustment of the loss, the President shall appoint one member of the Company and the loser one, and these two shall choose a third member, who shall proceed to adjust the loss. Their adjustment shall be final and binding on both parties. Each party shall bear equal portions of the cost.

Sec. 7. Any policy holder sustaining a loss shall at once notify the Secretary of the Company in writing, stating the cause and extent of the loss. The Secretary shall at once ascertain and proceed to adjust the loss by making a full statement to the Executive Committee of the facts in the case and the amount due the party sustaining the loss, which shall be endorsed as satisfactory by him or her. If sufficient funds are in the treasury to pay the loss they shall instruct the Treasurer to pay it at once, but if not the Secretary shall be empowered to make a pro rata assessment upon the members of the Company, and shall notify each member of the assessment, stating the amount due and the purpose to which it is to be applied. Such notice may be delivered personally or by mail; if by mail, service shall be deemed complete when deposited in the postoffice at the home office of the Company, and must be paid to the Treasurer within forty days from the date of notice. Upon failure to pay the same within the required time the delinquent member shall stand suspended, and during such suspension for non-payment of assessment the delinquent's policy shall be void, and the Company is not to be held responsible for any loss that may occur to the delinquent's property during such delinquency. If the delinquent fails to pay the assessment within sixty days from notice of assessment, he shall suffer a further penalty of 10 per cent. on the assessment, and the Company shall have recourse on the Premium obligation.

Sec. 8. No suit or action at law shall be sustained against this Company for any loss or damage by fire or lightning, unless commenced within six months after the loss or damage shall occur.

Sec. 9. Any fraud or attempt at fraud on the part of the insured shall forfeit all claim on this Company and vitiate the policy.

Sec. 10. The application for insurance shall be signed by the applicant, which shall make part of the contract of insurance and shall be a warranty of the truth of the facts stated therein, and shall be filed in the office of the Secretary.

Sec. 11. This company will not be responsible for loss by fire or lightening to unoccupied dwelling and tenant houses if the same is vacated for a period of more than 30 days unless by special consent of Executive Committee, to be made a matter of record by the Secretary. Any member who fails to get the consent of the Executive Committee thereby forfeits the insurance.

Sec. 12. At each annual meeting immediately preceding the election of directors, an Auditing Committee of three members shall be elected to serve one year. An Auditor shall not serve as Director. Twenty days prior to the next annual meeting following their election, the committee shall audit all the accounts of the officers of the company and make an itemized statement to the members in session at the annual meeting.

Sec. 13. Policies in this Company are perpetual, but the property to be subject to revaluation at the discretion of the Board of Directors. The Company reserves the right to cancel any policy issued by them, first giving due notice to the assured that he may show cause, if any, why the policy should not be canceled. Any member may withdraw from the Company by giving notice to the Secretary and paying up all claims of the Company and returning his policy to the Secretary. Any member taking additional insurance on property insured by this Company without first securing the consent of the Executive Committee through the Secretary, vitiates the policy issued by this Company.

Sec. 14. The sale of property or any change in the ownership terminates the insurance, but the purchaser or purchasers if a Patron or Patrons, may continue the insurance by assuming all of the obligations of the previous owner. Members disposing of property insured by this Company will be held responsible for all assessments until the Secretary is notified in writing of such disposal.

Sec. 15. Any member using a steam engine for threshing or other purpose who uses other fuel than coal (except for kindling fires) or fails to use all reasonable care, shall in case of loss therefrom forfeit the insurance.

Sec. 16. A bond shall be required by the Treasurer for the faithful performance of his duties as Treasurer, the amount to be fixed by the Executive Committee.

Sec. 17. There shall be appointed by the Executive Committee an Inspector to examine the Company's risks when deemed necessary by them.

Sec. 18. The compensation of the Secretary-Treasurer for services rendered by him to the Company, shall be regulated from time to time according to the amount of service required of him.

Sec. 19. No policy is binding until there is $100,000 of property insured by the Company.

Sec. 20. The home office of the Company may be at Buffalo, Putnam County, W. Va.

Sec. 21. This Company will not insure against loss occasioned by invasion, insurrection or rebellion.

Sec. 22. A vacancy occurring in any of the offices by death or removal shall be filled by appointment by the President until the next annual meeting.

Sec. 23. The Constitution and By-Laws may be altered or amended, at any annual meeting by a two-thirds vote of the members present.

The Grange then elected as temporary officers of Insurance Company, Bros., Hon. J. H. Collins, Buffalo, W. Va.; V. Pres., Hon. D. W. Skinner, Pliny, W. Va.; Secretary; Treas., M. V. Brown, Buffalo, W. Va.

Many other important matters have been considered, and proper plans inaugurated to more fully carry out the declaration of purposes, as promulgated by the great founders of this great Farmers fraternity.

It has honestly, faithfully and loyally represented the great agricultural interests of this State and Nation and the farmers should rally under its banner of justice and right, and make it, what its founders hoped, it would be, perpetual.

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